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Understanding Ethnobotanical Abortions: Chronological, Socio-Cultural, and Taxonomic Analysis in Michoacán and California

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ABSTRACT OF THE DISSERTATION

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This work investigates the socio-cultural and taxonomic dimensions of ethnobotanical practices that induce abortion through the use of medicinal plants. This work occurred during a crucial period of social unrest that arose from a lack of reproductive health services and rights. This movement, known as the Marea Verde (The Green Tide) is crucial since the spread of COVID-19, increased child pregnancies, femicides, and domestic violence (Huerta, 2020; Espino & Morales, 2020; Murray & Moloney, 2020). My current investigation allows me the opportunity to improve the content we teach younger generations in Mexico and the US regarding transcultural reproductive health and the cultural and political acts of rebellion against current policy through ethnobotanical abortions. This research presents a three-chapter exploration into the landscape of ethnobotanical abortions, focusing on Indigenous Mexican and Mexican

populations. The first chapter establishes a foundational understanding of abortifacients used in Mexico, addressing the gap in existing literature by integrating traditional knowledge with Western research studies. Building upon these findings, the second chapter investigates the retention and adaptation of ethnobotanical practices among migrated populations from Michoacán now residing in California. In the third chapter, the socio-cultural dimensions of ethnobotanical abortions are further explored within the context of Michoacán. Despite changes in legislation, societal stigmas and cultural norms continue to pose significant barriers and influence the practice of ethnobotanical abortions. Overall, this work contributes to a deeper understanding of ethnobotanical abortions in Mexico, highlighting the intersection of traditional practices, migration, and socio-cultural dynamics. By bridging gaps between traditional knowledge and Western research, it offers insights into the complexities of reproductive health and gender dynamics in marginalized communities.

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Introduction

Around 80% of people in developing countries utilize medicinal plants for their primary healthcare (Bodeker et al., 2005; Bandaranayake, 2006). Within this large scope of medicinal plant use are plants that are used to induce abortion in humans. It is significant to note the current options to carry out an abortion, using Western pharmaceuticals or having a procedural abortion at a clinic. Around half of abortions in the United States occur using pharmaceuticals (Guttmacher Institute, n.d.). In terms of what we know about plant-based abortions, the statistics are scarce. The most recent statistic we have is from the World Health Organization, which states that between 2010 to 2014, 14% of abortions were performed with unsafe methods, including using plants or inserting a sharp object into the uterus. Within the landscape of medicinal plant use and abortion, there are some interconnected issues currently in Mexico. After the initial COVID-19 lockdown, Mexico saw an increase in femicides, unintended pregnancies, and child pregnancies. About half of these unwanted pregnancies ended in abortion. Although abortion is decriminalized in Mexico, there is still a pervasive social and cultural stigma tied to abortion. Ethnobotanical abortions provide a valid alternative that does not require prescriptions or a clinical procedure and is rooted deeply in generations-long practices. Unfortunately, ethnobotanical abortions are vastly underreported, so the reality of their success and commonality is unknown. Altogether, these moving parts have worked to fuel and direct La Marea Verde, which is the movement that seeks reform for gender violence and reproductive health.

My first chapter builds a foundational level of knowledge on abortifacients used in Mexico, which is significantly lacking in the literature. A recent literature review of abortifacients, although digging deep into peer-reviewed sources, omits traditional texts passed on through generations within local communities in Mexico (Suarez, 1997). Moreover, my first chapter conducts a comprehensive literature review and goes further to perform statistical analysis on the significance of families that appear most frequently in literature. More specifically, although Asteraceae was cited in literature the most compared to any other family, a chi-square test revealed that this was not statistically significant when considering the immense diversity of species within the family. Compared to Rutaceae, which was cited frequently, although not as much as Asteraceae due to the smaller diversity in species, it was statistically significant. Furthermore, my first chapter performs a qualitative analysis of the evolution of keywords used and how censorship and the potential stigma of abortion influence how information on abortifacients is hidden or presented. This chapter resulted in a series of statistical analyses and qualitative analyses and a comprehensive list of plant species and families that have been used over generations in Mexico from 1904 to 2022. With this comprehensive list, I built a questionnaire to interview current populations on the accuracy of this list today.

My second chapter builds on the results of Chapter 1 by investigating what plants are retained within the plant-based abortion process among migrated populations born and raised in Michoacán now living in California. Chapter 2 takes a step further and not

only verifies through interviewing and ethnography what species are used currently out of the species mentioned in the literature but also digs deeper into the social and cultural implications of this botanical practice that is briefly mentioned in Chapter 1. More specifically, this chapter focuses on how migration impacts the transmission of generational knowledge, particularly in a practice seen as taboo in given spaces. Within the scope of migration, story sharers conveyed instances of adaptation and evolving generational practices to where they call home now, while still retaining knowledge of core species cited in the literature review in Chapter 1.

Lastly, my third chapter also delves into the socio-cultural dimension of ethnobotanical abortions. However, here I go back to the motherland, the Meseta Purépecha in Michoacán. The interviews and ethnography for this chapter dig deep into the weight that the lack of legal abortion and sociocultural stigma play on ethnobotanical abortions. Overall, despite changing legislation decriminalizing abortion, a majority of story sharers expressed that stigma rooted in social norms, cultural gender-based expectations, and religion will continue to place a significant barrier between ethnobotanical abortion practices. Additionally, this chapter focuses on aligning the folk taxonomy of species of interest with their Western scientific taxonomy. This aims to pay respects to the Indigenous names and the knowledge their names conveys while collecting specimens for herbaria to verify traditional taxonomy that can be tied to existing databases that give us insight into a plant's phylogeny and potential distribution and accessibility.

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Chapter 1

A Comprehensive Review and Statistical Analysis of Abortifacients in Mexico: Understanding Trends and Implications

Abstract

Reproductive rights groups, abortion collectives, and policymakers in Mexico have been successful in pushing for the decriminalization of abortion and have set in motion the process through the Supreme Court in 2020 (Medina Ávila & Mecalco López, 2023). Despite the expected increase in procedural and medication abortion access from this decision, plant-based abortions continue to exist as a long-standing, constantly evolving, and culturally aligned option for abortion. This review compiles peer-reviewed sources from the 1980s to 2023 regarding abortifacients in plants, sources only in print, and some only circulated among local communities in parts of Mexico. Our goal is to focus on the taxonomy and method of use for plants that have been and are currently still used to accompany ethnobotanical abortions in Mexico. Lastly, in compiling a comprehensive review of abortifacient plants, we cross-referenced the families of plants within our data with families that have been known to contain compounds that specifically induce abortion, such as the Papaveraceae family. Overall, this review gives insight into the evolution of the ethnobotanical abortion practice and the over- or under-represented nature of given plant families, which can be of interest to future biochemical and taxonomic studies.

Introduction

1. Ethnobotany and Abortifacients

Ethnobotany investigates the interaction humans have with plants, primarily how Indigenous people incorporate plants within medicinal and cultural practices (Balick & Cox, 2020). Most publications that guide plant use focus on interviewing and consulting with indigenous community members of the area (Ortiz de Montellano & Browner, 1985; Conway & Slocumb, 1979). Studies on ethnobotany include plant use that extends beyond medicinal purposes into all aspects of human culture, like food and spiritual and cultural uses (Balick and Cox, 2020).

A case of a plant that has shown deep cultural and economic value in Mexico is *Typha domingensis*. Also known as *chuspatel* to the Purépecha communities, it has been studied to support local economies of towns around Lake Pátzcuaro, Michoacán, through its artisanal uses dating back generations (Maldonado & Voeks, 2021). This invasive plant has been incorporated into a generations-long cultural practice of craft weaving by the Purépecha people of Ihuatzio, who supply crafts to towns across the entirety of Lake Pátzcuaro.

Another example closer to the proximity of reproductive health is the multitude of uses of *huitlacoche* or corn smut, *Ustilago maydis,* growing on corn ears and named *cuitlacochin* in Náhuatl. In modern agriculture, this fungus is seen as a plant disease that needs to be eradicated, but historically, it was used for its antibiotic properties in ancient Mesoamerica (Carmona Rosales, 2021). It has also been known to induce the abortion process (Dahl, 2009) and has been known to be an aid in childbirth, just like ergot

alkaloids while having a lower toxicity (Dahl, 2009). Ergot alkaloids stimulate uterine contractions, and extracts taken orally have been known to facilitate births and induce abortions (Liu, 2018). Aside from medicinal use, it has also been used and is currently used in Central America and Mexico for food purposes (Kealey et al, 1981; Valverde, Hernández-Pérez, & Paredes-Lopez, 2012). Lastly, corn, including the huitlacoche growing on it, played an important spiritual and cultural role in Indigenous North American groups (Adamson, 2012).

Within the general landscape of ethnobotany are plants, like chuspatel and huitlacoche, that have built and continue to enrich a culturally relevant at-home abortion practice. Ethnobotanical abortions are a living, changing, and evolving practice. This knowledge is traditionally kept by indigenous people who can educate us on the taxonomy and cultural value of plants that accompany abortion processes. Plant-based abortion processes include preparation care, inducing the abortion, and post-abortion care. For many people, the use of plants to accompany abortions is not strictly transactional but has deep cultural and spiritual value (Olmos, 2022). Preparation care can include reducing anxiety, softening the cervix, opening the cervix, and warming the body. In addition to physical preparation, there are instances of prayer. For example, an abortion support guide from Chile and Argentina depicts a prayer and invocation of Saint Dora Sanadora when beginning the abortion process (Ballena, 2016).

The abortion process is not limited to the expulsion of material in the womb and consists of a cycle of physical, mental, emotional, and often spiritual care. Preparing for the abortion can include taking supplemental medication or plant products to prepare or

minimize side effects such as nausea or pain. Inducing an abortion includes specific processes that induce contractions, inhibit implantation of the embryo, induce menstruation, and empty out womb contents. Post-abortion care can be a culturally and spiritually significant part of the overall abortion journey. Care after an abortion is aimed at closing the cycle spiritually and physically. This often consists of herbal baths aimed to heat up and tighten the body after all contents in the womb have been removed. Aftercare can also consist of prayers and/or rituals (Olmos, 2022). Overall, it is crucial to consider all dimensions related to abortifacient plants in Mexico. Abortifacient plants in this review are not standalone tools for purely transactional uses. They have deep socio-cultural roots that shape their uses and safety.

2. Study Area

This literature review focuses on Mexico during a time of great activity, specifically for reproductive justice. During the 2020 pandemic, there was a noticeable increase in social activism in Mexico and Latin America regarding unwanted pregnancies and gender violence (Espino & Morales, 2020) that pushed reproductive health to the forefront of public attention, including plant-based abortions. According to prior literature and current interviews, there is a long history of stigma and shame regarding abortion in Mexico (Ona, 2020; Wollum et al., 2022). The long and continued stigma, criminalization, and violence towards people who choose abortion has long fueled the Green Tide, La Marea Verde. The Green Tide is a social movement born from a demand for justice in gender violence, reproductive justice, and femicides in Argentina that spread throughout South and Central America, and Mexico (Palmeiro, 2018). Recently in

2020, the Green Tide in Argentina succeeded in legalizing abortion (Lopreite, 2023). More recently, in 2021 Mexico's Supreme Court ruled the criminalization of abortion to be unconstitutional (Medina Ávila & Mecalco López, 2023). Amidst this landmark decision, the stigma and criminalization of abortion continue. Weeks after the court decision, at least one person in Michoacán, Mexico was already being tried for homicide for a voluntary abortion (García López et al., 2021). Two years later, the Supreme Court moved to demand that Congress remove federal criminal penalties in place (Tamés & Carasco, 2023), building a pathway for federal health facilities to provide abortion services. Despite the common methods of medication or procedural abortion, the people of Mexico deserve to choose from options that align with their cultural values and needs.

Plant-based abortions exist as a culturally relevant option to many in Mexico. The existing rich cultural practices that hold herbal abortion options derive from the Indigenous populations. There are around 32 Indigenous groups in Mexico, with their populations concentrated within a third of Mexico's states (Fox, 2010). Some Indigenous groups of Mexico, such as the Totonaca & Nahuatl, utilize plants pre-, during, and after an abortion. For some, the abortion process has strong spiritual and cultural components. The Totonaca & Nahuatl believe that the ancestral tree Puchat or Chichihuacuauhco, respectively, nourishes and cares for the spirits of babies until they are called to be with their parents (Olmos, 2022). After an abortion, the spirit returns to the ancestral milk-giving tree. Some people of these Indigenous groups in Mexico hold plant-based postpartum traditions and altars for the spirit of their babies (Olmos, 2022).

Materials & Methods

Our data collection was conducted for over two years and focused on various sources, from physical books published in Mexico not available online to search engines such as Google Scholar, JSTOR, and the University of California, Riverside's online library. Databases and search engines were utilized to collect any articles that included plants that induce abortion or symptoms that may lead to it, such as inducing menstruation, anti-implantation of embryos, and inducing contractions. Books and peer-reviewed sources ranged from 1904 to 2022 at the most current. Some print books have been circulated among local community members for generations and are particularly well known, such as Patzcuaros' Manual of Medicinal Plants (Suarez, 1997). Articles varied in terms of the journal; some articles were derived from journals focusing on Clinical Toxicology, Ethnopharmacology, Pharmacy, and Ethnobotany. We used keywords including 'detenido flujo,' 'emenagogo,' 'provoca contracciones,' 'abortifacient,' 'aborto,' 'abortion + plants,' 'emmenagogue,' 'oxytocic,' 'abortivo,' and 'herbal abortion.' Within these keywords, we narrowed down research that focused on Mexico. Plants indicated to primarily cause harm by being generally poisonous were omitted. We focused on collecting information, if known, that included the plant's taxonomy, Indigenous names, geographical origin (endemic, invasive, exotic, or native), mode of action, preparation, and active principle.

All information was compiled into an Excel spreadsheet. Once the family, genus, and species name were collected, we statistically determined through a chi-square test which families are under or overrepresented in the literature compared to their overall

species presence nationally. To perform this chi-square test we compiled the top 11 cited families. We collected the number of species that pertain to each family nationally. Using this data we calculated how often we expect a family to be cited based on the size of species each family contains. With this information, we calculated our residual and *p* factor to understand how far each over or under-represented family depends on the expected occurrence.

Furthermore, we analyzed several patterns within our compiled Excel spreadsheet, including the evolution of plants cited across time, considering their geographical origin and ethno species (grouping of genera with similar ethnobotanical use). Following a review of our compiled data and the statistical review of the families, we also considered how our results correspond with existing phytochemical studies. According to phytochemical studies in the past isoquinoline alkaloids, best represented in the Ranunculaceae, Papaveraceae, and Berberidaceae families, are most commonly known to induce abortion (Gupta, Dixit, & Dobhal, 1990). Therefore, we expected to see an overrepresentation of these families in our review.

Results

1. Socio-Cultural Dimension of Abortifacients

Plants used for reproductive health care in Mexico have been researched not only regarding what plants are used but also how this information is shared and guarded (Browner & Perdue, 1988). In some cases, plants used for reproductive care are guarded from men as a way for women to exercise reproductive autonomy (Browner & Perdue, 1988). Despite being riddled with social stigma and criminal penalties, abortifacients are

part of a generations-long practice that has been passed down orally albeit with some hesitation (Browner & Perdue, 1988). Under certain circumstances, the abortion process has even been noted to be acceptable by midwives to help an individual induce or regulate their menstruation (Castañeda et al., 2008). However, in the grand sense, abortion is viewed by many midwives as an "unforgivable sin" for whoever attempts the abortion (Castañeda et al., 2008). Even miscarriages were often equated to provoked abortions, claiming a miscarriage is a woman failing her duty to carry out a pregnancy (Castañeda et al., 2008). A study focusing on birth workers that include people who have induced abortions demonstrated that individuals in the study area of Morelos, Mexico, felt their abortion was justified for specified reasons while still disapproving of other individuals who decide to abort (Castañeda et al., 2008). The overall reasoning and justification for having abortions is made at the individual level, despite the continuous reinforcement of abortion stigma.

Within Mexico, there is a substantial presence of accompaniment and abortion doula work that tend to the emotional and mental support aspect of abortion and further speak to the social and cultural support provided by certain groups within the local community. A particular study on accompaniments has found that this available support can help increase the positive emotions people feel when undergoing the process of having an abortion while lessening negative emotions (Wollum et al., 2022). Accompaniment is a part of all abortion processes, be it at home (medication abortion), procedural, or plant-based (Broussard, 2024). More specifically, accompaniment is provided by feminist activists and trained volunteers (Veldhuis et al., 2021). Activists

refer to those who partake in accompaniment and are often connected to local collectives with ties to the larger Marea Verde (Green Tide) movement. Overall, the abortion process has complex social and cultural dimensions tied to long-standing stigmas, feminist movements, gender roles, and religion.

2. Taxonomic Dimension of Abortifacients

A total of 119 species and 45 families were identified in this review of abortifacients in Mexico. The 11 most commonly cited families included: Asteraceae, Lamiaceae, Apiaceae, Rutaceae, Verbanaceae, Fabaceae, Amaranthaceae, Malvaceae, Commelinaceae, Aristolochiaceae, and Lauraceae. These families were cited four or more times from 1950 to 2021. Through a chi-square test, we were able to see that the Asteraceae, although the most commonly cited family, was in reality underrepresented when taking into account its large global species count (32,000 species; Table 1). The number of times the Asteraceae are cited is proportional to its species richness and does not differ significantly from the statistically expected value. Similarly, the Fabaceae displayed the largest and only significant underrepresentation across the families cited as having abortifacient properties (Fig. 2). In contrast, the Rutaceae were highly overrepresented in the literature, with the highest significance out of the 11 families (Table 1, Fig. 2). Following Rutaceae, we see Verbenaceae and Apiaceae holding a considerable significance by being vastly overrepresented compared to what would be expected (Fig. 2).

Aside from the over and under-represented families in our review, we see that families like Lauraceae, Lamiaceae, Amaranthaceae, Commelinaceae, and Aristolochiaceae [LS1] are represented within the literature roughly around expected according to their global species richness. Aside from the occurrence of citations in literature, we also analyzed the temporal distribution of these families in literature. Asteraceae, Rutaceae, Apiaceae, Verbanaceae, and Lamiaceae were first reported as potential abortifacients in the 1950s, while Amaranthaceae was first discussed in 1964. All families have persisted and have been documented for abortifacient use throughout 2020-2021. However, some families have experienced gaps in documentation when observing the timeline from 1950 to 2021. Most notably, Lamiaceae has a large gap between publication years; although it was one of the most commonly cited families, there was a period of absence for this family in literature after 1950 up until 1997 (Fig. 3). Analyzing the evolution of plant families used in literature is particularly significant when considering the frequency of families cited and any instances of large gaps within abortifacient literature.

Aside from the most cited families, we focused on the top ten cited species in our review. We will discuss four species in terms of ethnospecies groupings. For example, *Ruta graveolens* and *Ruta chalepensis* belong to the same ethnospecies group. Much like *Montanoa tomentosa* and *Montanoa frutescens* belong to the same ethnospecies group (Table 2). Both of these groups (*M. tomentosa* with *M. frutescens* and *R. graveolens* with *R. chalepensis*) are within the same genus, share the same medicinal uses, and share the same common name in Spanish (Table 2). Through healers' consensus, *R. graveolens* and *R. chalepensis* have been named the same way and are known as Ruda (Zamora-Martínez

& de Pascual Pola, 1992; Fonseca-Chávez et al., 2020). At the same time, *M. tomentosa* and *M. frutescens* are identified by healers as Zoapatle. In interviews and fieldwork, healers' consensus is used to verify a plant for anthropological uses. Overall, we have two ethno-species that makeup 44% of citations in the abortifacient literature of Mexico.

Similar to the temporal analysis of families in our review, we also looked into how often species persisted throughout time. In addition to the counts for each species mentioned in the literature (Fig. 4), we also took note of which years each species was cited to observe the frequency of their appearance through time (Fig. 5). This shows us which species, although mentioned numerous times in literature, exhibit gaps within periods.

3. What do we know about abortifacient plants in Mexico?

By using healers' consensus, we can confirm the taxonomic details of plants and their intended uses. As mentioned before, we utilize the term ethnospecies to refer to species that contain the same common name in Spanish, have the same intended use, and share the same genus. These ethnospecies are considered the same plant by healers regarding its uses. As mentioned, Ruda and Zoapatle are used for two sets of different species (Table 2). Along with healers' consensus, herbarium voucher specimens can confirm healers' consensus by documenting the plant species, collection location, reproductive stage of the plant as flowering/non-flowering, and common name.

The potential mode of action for most of our species of interest, specifically in Mexico, is stated through a combination of consensus among healers and laboratory studies. For example, *Ruta chalepensis* is known to induce abortion, menstrual flow, and

uterine contractions. This is according to healers' consensus and a study that tested extracts on pregnant mice that found embryotoxic effects after its application (Gonzales et al., 2007). Other studies acknowledge healers' consensus of plants and explore the chemical composition of these plants on this basis. For example, two studies investigated the chemical composition of Oregano, including one of its uses as being known for abortive effects (Lin et al., 2007; Martínez-Rocha et al., 2018; Cortés-Chitala et al., 2021). However, the extent of these studies does not link or discuss the abortive mode of action further.

4. Unknowns of abortifacient plants

Regarding the limitations of what we know regarding abortifacients, the mode of action is often missing but so is the mechanism of action and the active principle. For a majority of plants that accompany abortion processes in literature, the role they play in an abortion is often reduced to "abortive" or "abortifacient," which gives us little information on what the plant extract does. Of all the plants cited in the literature to induce abortion 21% of plants were cited as "abortifacient" with no further clarification on how exactly an abortion is triggered. Although healers' consensus, often gives us the intended effects of these species within abortion processes. There is sparse literature regarding what and how specific compounds are responsible for inducing an abortion in people.

Discussion

From our data compilation and analysis, we can see that plants with abortive properties have been used for generations and, in all likelihood, will continue to be used.

We can also see that several plants have persisted through generations since 1950 and are still being used. Beyond these frequently mentioned plants, there are an additional 122 species that have historically been integrated into the practice of plant-based abortions. Abortifacients, although sparse within the larger realm of medicinal plant use research, have deep social and cultural ties that provide a strong foundation for the continuation of their dissemination. This review of abortifacients used in Mexico has shown us the evolution of species and plant families over time, and it has uncovered the degree of accessibility of abortifacients in peer-reviewed literature.

Our sources, be they peer-reviewed articles or print books circulated locally in Mexico, often presented abortifacients within the lens of "do not use if pregnant" or "avoid during pregnancy" as opposed to outright labeling the plant use as "emmenagogue" or "abortive." In this case, the very manner in which information is documented displays a form of censorship and perhaps even abortion stigma. As we began our literature review process, we began searching for literature that discussed plants as "abortive," "herbal abortion," and "abortifacient," specifically filtering for literature focused on Mexico that discusses these plants through the lens of choosing to use them for an abortion. However, we began to find that literature discussed these plants through the perspective of avoiding them for pregnancy to prevent an abortion. The keywords we utilized then evolved to include "emmenagogue," "oxytocic," "induce contractions," and "induce menstrual flow." We approached our literature review with a focus on precise terminology, acknowledging that much of the existing literature discusses abortifacients euphemistically, avoiding direct use of the term 'abortion'.

Ethnobotanical abortions in Mexico are a living, changing, and continuing practice. This knowledge is traditionally held by Mexican, indigenous, and Mexican migrant women and includes plants' taxonomic and social-cultural value. Aside from their application to their practical use for abortion, there is much to be investigated regarding their role in social mobility as tools for bodily autonomy and through managing if a pregnancy is carried out.

In addition to further researching this practice and these plants within the social and cultural realm, researching the species and families that make up the continuing practice of ethnobotanical abortions through a biochemical lens is crucial to addressing the knowledge gap of abortifacients (Shah et al., 2009; Gonzales et al., 2007; Ciganda & Laborde, 2003), and fueling the current reproductive justice movement in Mexico, The Green Tide (Acevedo, 2019), that has accomplished so much to the nationwide decriminalization of abortion in Mexico (Medina Ávila & Mecalco López, 2023).

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Figures and Tables

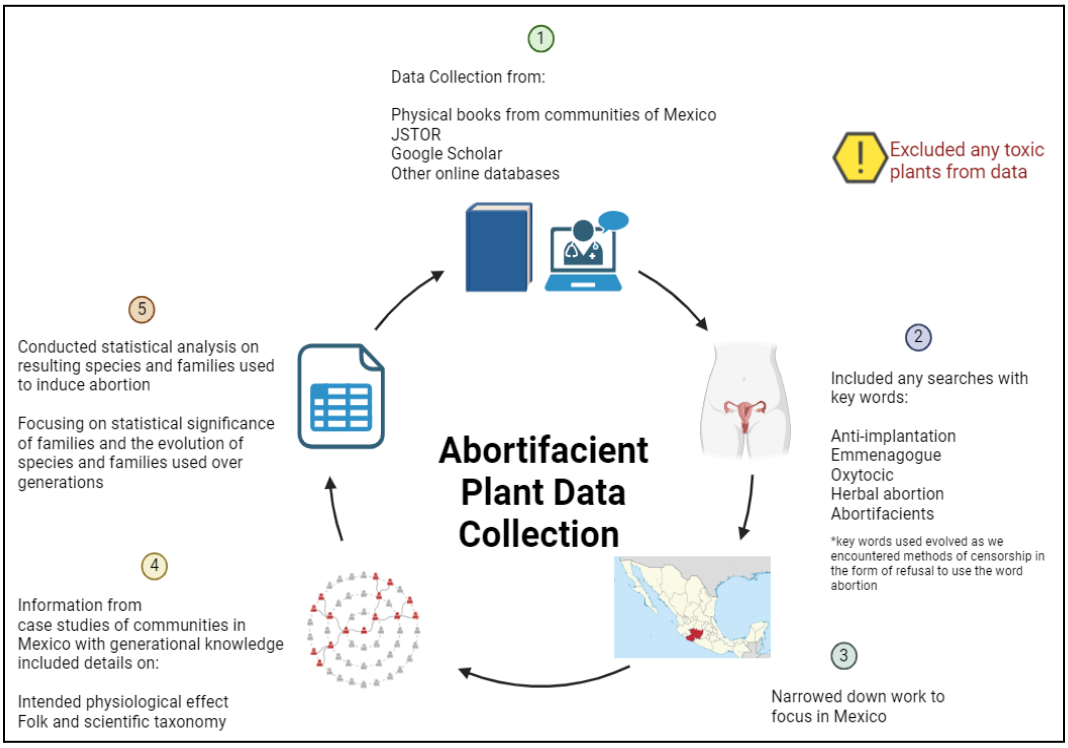

Figure 1.1: Our literature review consisted of a series of steps to focus on our study area of Mexico and included a step to analyze the significance of our results.

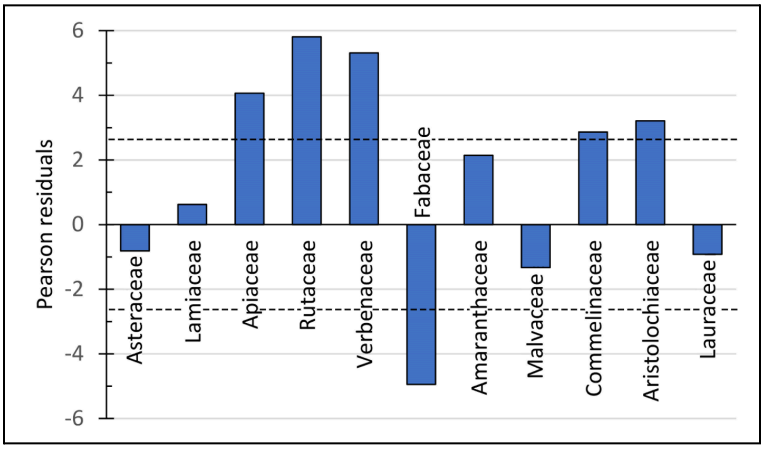

Figure 1.2: Relative proportion of abortifacients reported within each family (standardized difference between observed and expected, or Pearson residuals; see Table 1). The dotted lines mark the 1% threshold ($P = 0.01$) for both positive and negative residuals. Note the overrepresentation in the literature of plants belonging to Rutaceae, Verbenaceae, and Apiaceae, and the low proportion of abortifacients reported for the Fabaceae.

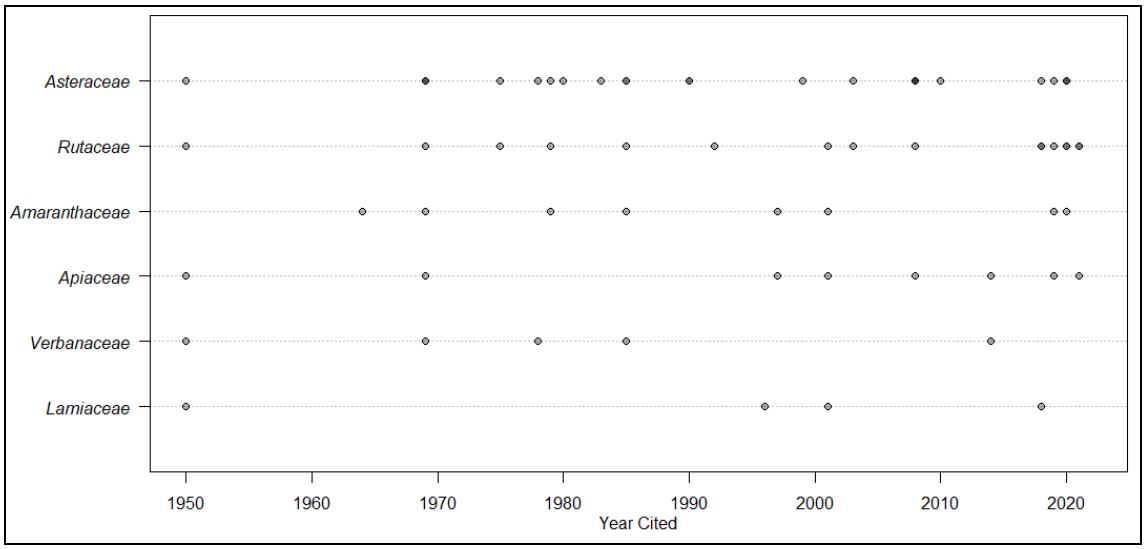

Figure 1.3: The graph above displays the evolution of plant families used to induce abortion in Mexico from 1950, when most families were first mentioned, to the most current literature in 2021.

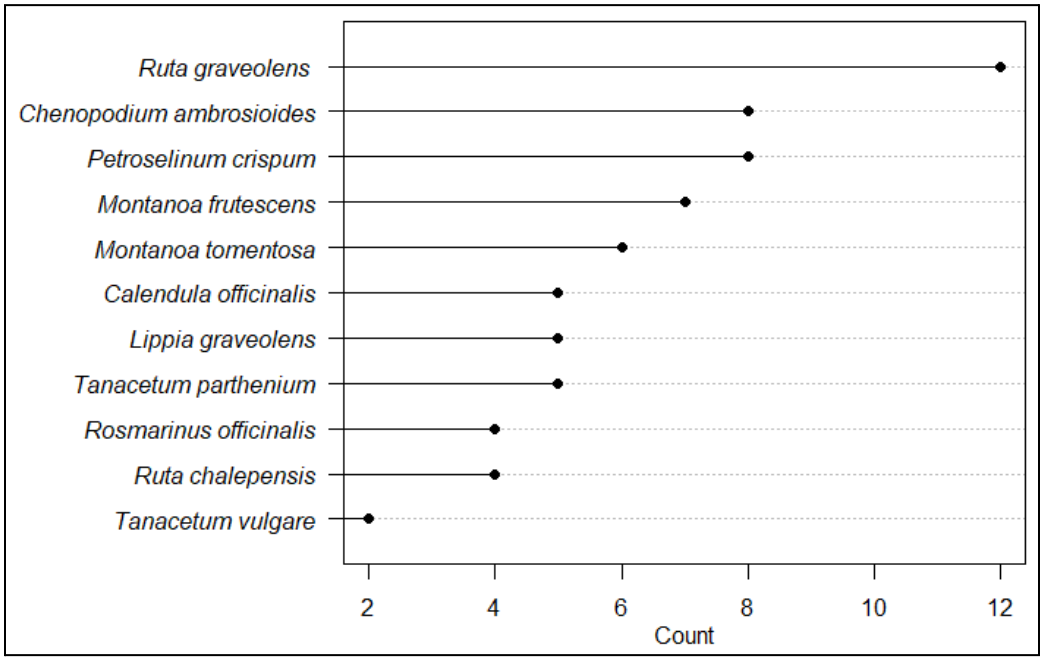

Figure 1.4: The graph above displays the count of citations for each species.

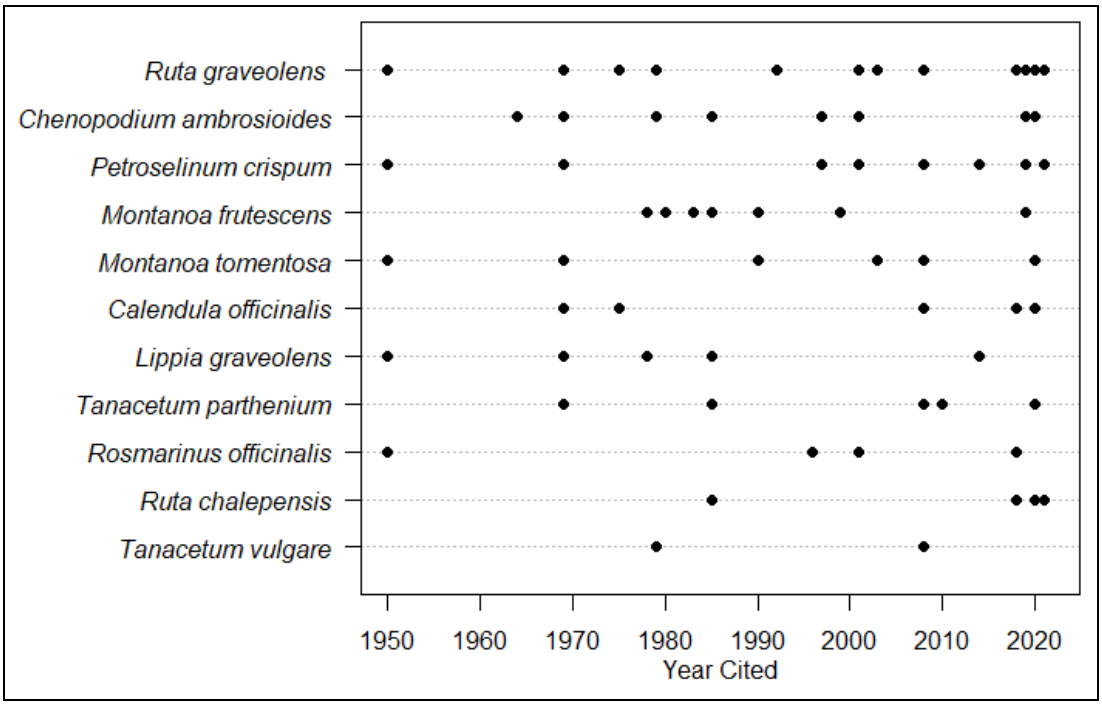

Figure 1.5: The graph above displays the evolution of plant species used to induce abortion in Mexico from 1950, when most species were first mentioned, to the most current literature in 2021.

Family	Times Cited	Total species	Expected	Residual	p-value	Significance
Asteraceae	47	32,000	53.0	-0.82	0.2063	
Lamiaceae	18	9,398	15.6	0.62	0.2676	
Apiaceae	18	4,313	7.1	4.07	0.0000	**
Rutaceae	16	2,509	4.2	5.81	0.0000	**
Verbenaceae	9	1,103	1.8	5.31	0.0000	**
Fabaceae	9	24,496	40.5	-4.95	0.0000	**
Amaranthaceae	9	2,704	4.5	2.14	0.0162	
Malvaceae	6	6,189	10.2	-1.33	0.0925	
Commelinaceae	5	902	1.5	2.87	0.0020	
Aristolochiaceae	5	795	1.3	3.21	0.0007	**
Lauraceae	4	3,805	6.3	-0.92	0.1800	
Total	146		146	129.85 (x^2)	5.021E-23 (p)	

Table 1.1: The 11 most commonly cited families within our review were run through a chi-square test to determine significance levels. Apiaceae, Rutaceae, Verbenaceae, Aristolochiaceae, and Fabaceae showed the most significance. Apiaceae, Rutaceae, Aristolochiaceae, and Verbenaceae specifically show a significant overrepresentation of citations compared to what we expect based on their species counts. On the other hand, Asteraceae, Fabaceae, Malvaceae, and Lauraceae show an underrepresentation within the literature.

Common Name (Spanish)	Species	Physiological Effect	Citation
Ruda	*Ruta graveolens*	Emmenagogue	3, 10, 14, 17, 51, 42, 45, 46, 52, 53, 56, 65
Ruda	*Ruta chalepensis*	Oxytocic, Emmenagogue	22, 46, 49, 53
Epazote	*Chenopodium ambrosioides*	Abortifacient, Emmenagogue, Oxytocic	3, 14, 22, 40, 42, 45, 49, 57
Perejil	*Petroselinum crispum*	Abortifacient, Emmenagogue	3, 10, 17, 42, 45, 46, 57, 59
Zoapatle	*Montanoa frutescens*	Oxytocic	3, 24, 38, 39, 49, 54, 62
Zoapatle	*Montanoa tomentosa*	Abortifacient, Emmenagogue, Oxytocic	10, 12, 22, 39, 42, 52
Altamisa	*Tanacetum parthenium*	Abortifacient, Emmenagogue, Oxytocic	17, 22, 42, 49, 63
Calendula	*Calendula officinalis*	Abortifacient, Emmenagogue	17, 42, 51, 53, 56
Oregano	*Lippia graveolens*	Abortifacient, Emmenagogue	10, 42, 49, 59, 62
Romero	*Rosmarinus officinalis*	Abortifacient, Emmenagogue	10, 32, 45, 53

Table 1.2: Listed here are the top ten most cited species in the literature regarding abortifacients in Mexico. There are two ethnospecies here represented as Ruda and Zoapatle. There are a total of three physiological effects mentioned by healers in studies. Emmenagogue signifies the species is used to induce menstrual flow as a method of abortion. Oxytocic means that this species induces contractions as a mode to induce an abortion and evacuate material from the womb. Lastly, abortifacient is a blanket term used when the specific action is unknown, but the result is an abortion.

Chapter 2

Cultural Continuity of Abortifacients: Michoacán Migrants in California

Abstract

Ethnobotanical abortions are widely known within the realm of medicinal plant use and contain a deep social and cultural value for the community of migrant populations from Michoacán. Drawing on two ethnographies with expert-level healers of Indigenous Mexican descent, and a series of in-depth interviews, this study investigates the social and cultural value of ethnobotanical abortions in migrant communities from Michoacán, Mexico. The core questions that encapsulate this work are: How present is knowledge on ethnobotanical abortions within medicinal plant use? What are the cultural dimensions of ethnobotanical abortions for Mexican migrant women? I incorporate several approaches and theories from feminist research methods into an ethnobotanical theoretical framework. This study finds that women in migrant Mexican communities retain knowledge and incorporate plant knowledge around their current homes which have often gone undocumented due to the historical marginalization of women in Mexican culture.

Introduction

1. Ethnobotany

Ethnobotanists study how people use plants, usually focusing on Indigenous communities, from which this knowledge is derived. Ethnobotany is not limited to medicinal plants but includes plants for spiritual or cultural uses. As has been seen in

previous studies, plant knowledge derived from Indigenous communities is invariably linked to spirituality and culture, including medicinal plants. A particular study focused on Northwest North America found that there are spiritual aspects tied to the harvesting and use of plants by Indigenous communities of the respective areas, although the magnitude of their presence is variable along communities (Turner, 2016). Overall, around 80 percent of the world's population in developing countries still uses medicinal plants as primary health care (Khan and Ahmad, 2019).

Existing literature that prioritizes the knowledge and experiences of participants has worked to establish existing links between medicinal plant use, cultural dimensions, and spirituality. Previous work has also recorded and analyzed specified plants related to reproductive health and their respective cultural ties (Browner, 1985; Conway and Slocumb, 1979). For example, ailments such as infertility are sometimes tackled with the approach to 'cleanse' the patients' blood connected to the occurrence of menses. A delay in menses is sometimes tied to evil deeds done by witchcraft. This is just one of the many examples that solidify how essential spirituality and culture are to medicinal plant use. Furthermore, within this realm of medicinal and cultural plant use for reproductive health is the use of plants for abortion, and abortifacient plants.

2. Ethnobotanical Abortions

Currently, one of the issues pertaining to ethnobotanical abortions is the lack of knowledge that exists about their presence and success. In the aftermath of the COVID-19 lockdown, there was a notable surge in femicides, as well as increases in both unwanted pregnancies and instances of child pregnancies (Huerta and Huerta, 2020; Espino and Morales, 2020; Murray and Moloney, 2020). At the time of the initial lockdown, a limited number states in Mexico had legal abortion, and some that did also exercised restrictions. Furthermore, legalizing abortion in some states of Mexico has led to a crackdown on tighter legislation on abortion in other states. Despite the recent decriminalization of abortion in Mexico there is still much work to be done regarding local enforcement to protect abortion seekers (Bonifaz Alfonzo & Mora Sierra, 2024).

Although ethnobotanical abortions have a long history of existence and cultural ties to Mexican and Indigenous people, they can also serve as an alternative to medical abortion. Regrettably, it is challenging to gather data on ethnobotanical abortions, and consequently, the positive outcomes of these procedures often remain unshared. Ethnobotanical abortions, along with self-induced abortions using pharmaceuticals, are not legal in many regions of Mexico. Reporting a self-induced abortion could result in facing criminal charges. Most cases of reported ethnobotanical abortions are worst-case scenarios that require medical intervention (Tisserand and Young, 2013). Ethnobotanical remedies that induce abortion commonly occur in infusions from plant parts. This ethnobotanical practice is crucial during The Marea Verde (The Green Tide), a current

movement within Mexico & Latin America born from social unrest by women demanding reproductive rights, among other issues involving femicide, sexual assault, and other gender violence. Furthermore, despite Catholicism rejecting abortion practices and being a dominant religion within many communities in Mexico, alternative forms outside of medication and procedural methods of abortion are commonly practiced using natural abortifacients that occur in plants (Conway and Slocumb, 1979).

In the literature, there is evidence of a drive to pursue alternative forms of abortion using plants in different countries. For instance, Delay (2019) investigated the preference for plant-based abortions in Ireland. The results showed that plant-based abortion aside from its cultural value, gave story sharers a feeling of self-autonomy and power over what enters their bodies. On the other hand, Grossman et al. (2010) revealed through a study in the United States that women sought out ethnobotanical abortions due to barriers within the medical system. Their work did not focus on cultural ties to ethnobotanical abortion under the assumption that the driving force towards choosing plant-based abortion was a necessity. However, story sharers in this study did state that the ability to self-induce abortion was vital so they could avoid the complicated process of being evaluated by a physician.

Lastly, with the oncoming struggle to decriminalize and legalize abortion in respective regions, and the falling of Roe v. Wade in the U.S., the approach towards safe dissemination and practice of ethnobotanical abortions has been well documented. Lewis (2016) spoke with a well-known herbalist who was knowledgeable about abortifacient

plants. This herbalist expressed prioritization of sharing information and never advising on abortions. This was a minor detail in the paper but is incredibly important for researchers, doulas, and healers working to retain knowledge on plant-based abortions. A brief change in language between saying “you can” or “you should” to “people usually do this” can make the difference between facing legal repercussions or not for the provider of information (WHM, 2024). Although this change in language does not extend legal safety to the individual inducing an abortion, there are other common precautions for those inducing abortion that may help protect them. Intention to abort can be concealed to a degree considering that the effects of abortion medication, Mifepristone and Misoprostol, along with medicinal plants like *Salvia rosmarinus* (Lemonica et al., 1996), mimic the signs of a miscarriage, cramping, and bleeding. Rosemary, in particular, causes implantation failure of the embryo to the uterus, which is a widespread way miscarriage occurs (Almeida and Lemonica, 2000). Beyond individual decisions on abortion methods, the use of abortifacients reveals intricate ties to politics and economics, while also bearing profound social and cultural implications.

Materials & Methods

Through interviewing I have included key theories and approaches from feminist research, including memory work (González-López, 2017) and a feminist interviewing approach (Johnson, 2016). Since ethnobotany can steer toward anthropological or ecological methodology, a theoretical framework incorporating both fields is necessary (Gaoue et al., 2017). Considering this, I incorporate social network theory from

ethnobotany research into my methods to predict how traditional ecological knowledge is shaped by an individual's social network (Gaoue et al., 2017). This social network theory is echoed in my interview questions and responses.

Through a series of semi-structured interviews, story sharers utilize memory work (González-López, 2017) to differentiate between their personal uses of medicinal plants versus any instances where abortion-inducing plants are specifically utilized. Story sharers were not limited to individuals who themselves experienced ethnobotanical abortions. Interviews included individuals who held any knowledge of ethnobotanical abortions. I focused on interviewing individuals from botanica shops and healers. Memory work occurs when story sharers recall past experiences and make sense of them in an interview setting. This format for interviewing is relatively time-consuming compared to a survey or structured interview. Therefore, interviews lasted from one to two hours.

Interview questions include the identification and use of plants and the social and cultural dimensions of this practice by implementing a feminist approach (Johnson, 2016). Using a feminist approach allows me to incorporate questions that move away from documenting tangible processes and facts, and move instead to documenting feelings and emotions, including but not limited to feelings of self-autonomy, abortion stigma, connections to The Green Tide, and any related personal experiences.

In addition to interviewing, ethnography was also conducted through participant observation with individuals experienced in preparing medicinal plant remedies. These

ethnographic experiences were about three hours each and conducted alongside two expert-level healers. Ethnography consists of participating in preparing herbal remedies and shadowing what the process is like concerning collecting plants and preparing them.

Story sharers for this research included Southern California residents born or having lived in any town within Michoacán and migrated to California. The sample of the study included individuals holding differing levels of plant knowledge and use, of different ages from 18 to 64, and ranging from pro-abortion to conditionally anti-abortion. Sampling was conducted using snowball sampling with story sharers living in cities and suburbs of Northern and Southern California. Lastly, contributors of two in-depth ethnographies conducted in this study are of Purépecha descent. The Purépecha people are an Indigenous group of Michoacán. It is significant to recognize that the traditional knowledge in this study, although focused on migrant populations from Michoacán, derives from generations-long practices of the Purépecha community.

Previous literature on ethnobotanical abortions has taken differing approaches considering the researcher. Some literature has focused on reporting plants, uses, and phytochemistry data (Akbarizadeh et al., 2018; Bateman et al., 1998; Elemo et al., 2022). On the other hand, social science research papers and books have worked to prioritize the reasoning, value, and input of individuals who retain knowledge on ethnobotanical abortions (Browner, 1985; Conway and Slocumb, 1979; Delay, 2019; Grossman et al., 2010; Lewis, 2016; Nations et al., 1997).

After gathering qualitative data and analyzing oral histories produced from memory work, I cross-referenced data on plants discussed in interviews with existing literature (Table 1). These sources ranged from ethnographic to phytochemical studies. The point of this cross-referencing was to support the healers' consensus. Although it is not necessary for this work, providing this cross-reference data in a larger conceptual sense is important. Cross-reference data that support healers' consensus works to break down the misconception that healers and herbal remedies are placebos. This is something that Indigenous knowledge consistently faces when attempting to fit within a Western perspective.

Results

1. Cultural Value

The use and role of plants to induce abortion spans far wider than being born from necessity. Ethnobotanical abortions have a place within the culture of medicinal plant use among migrant Mexican women. Story sharers expressed the continued presence of this knowledge within their familial circles and that it exists in their blood. This refers to the knowledge derived from Indigenous people, the Purépecha, from where story sharers' families have come from.

> "From the age of 10, my siblings and I learned [to use plants medicinally]. We had an aunt Sara … that dedicated herself to using plants to cure… ailments…and [sometimes] used oregano for pregnant women to abort or cement their

pregnancy. … all of her work my siblings and I learned as kids. But we have this in our blood." – L.

Throughout generations, Mexican women have passed down culturally valuable knowledge of ethnobotanical abortions that has persisted despite migration.

"They all knew. My grandma knew. Before my grandma, the other one [great-grandmother] knew too. They always knew what plants to use and they pass it down to us." – H.

In addition to passing down the knowledge of plant-based abortions embedded within medicinal plant use culture, this knowledge gives women power within their own homes. Women of this migrant community of Michoacán, Mexico, were raised within a heavily patriarchal society that enables machismo. Machismo manifests in different ways, from restricting womens' reproductive rights, and confining women to household labor, to gender violence. Empowering women in cultures deeply rooted in machismo, where knowledge is traditionally handed down exclusively from grandmother to mother to daughter, leads to a notable shift in power dynamics. Historically, and verified by story sharers, men have always had the final say within their homes within this community. However, having the knowledge and power to cure ailments and induce abortions gives women a role that men cannot or usually do not occupy.

"Using the plant for medicine or abortion is work! This helps you feel stronger and more power[ful] than men. It's something that in your house you are the only one that knows!" – H.

The cultural significance uncovered through storytelling highlights how preserving knowledge about abortion-inducing plants can empower women, enabling them to assert authority within their households and assert control over their reproductive choices, particularly in cultures embedded with machismo, where such autonomy tends to be challenged.

2. Retention of knowledge

Despite the taboo and tricky legality surrounding abortion, most story sharers expressed retention of ethnobotanical abortion knowledge. However, some story sharers expressed a loss of traditional knowledge and a desire to recover this knowledge.

> "I'm going to reclaim all that knowledge and I'm going to somehow find out everything she [story sharers' mother] knows and write it down." - X.

In this situation, the taboo and stigma of abortion hindered the passing on of information from mother to daughter. Despite the loss of knowledge, this individual retained this cultural practice by adapting and evolving the practice by using plants that were highly used in the current area where the story sharer lived.

> "I do remember in high school [hearing about] … black cohosh then there is the blue, the blue cohosh. And just recently I heard about mugwort. But the blue and black cohosh was really big. I remember when I was 16 I had gotten pregnant … I took the black and blue cohosh root and my period came." - X.

Furthermore, the practice or knowledge retention does not come unscathed from the taboo and legality issues. Within the south-central Mexican community, almost

nothing is viewed as worse than inducing an abortion. Situations like being pregnant and unmarried were equated with the same level of shame as inducing an abortion.

> "Interviewer: So what was worse that you were pregnant and unmarried or that you had an abortion using plants? What would have been more embarrassing?
>
> H: Hmm. Well, both. People saw both bad. 'No hay ni pa donde irse' [there is no clear way to see which is worse]."

Considering this attachment of shame to plant-based abortion, this greatly discouraged sharing experiences among women even within their own families. This causes ethnobotanical abortions to be often an isolated event lacking much-needed support.

> "No, they do it [induce plant-based abortions] by themselves [with no family support or awareness]. Hidden." – H.

In addition to shame, these practices are often associated with evil doing and things "not of God." Rifts between families can and have occurred, according to story sharers. These rifts have the potential to form a disruption in the flow of ethnobotanical abortion knowledge shared through generations.

> "People that are too religious think that these [practices] are bad. Even in our own family..." – H.

Aside from the shame and negative connotations attached to plant-based abortion, the lack of legal abortion plays an important role in knowledge retention and practice.

Fear of legal repercussions associated with seeking or aiding abortion can discourage individuals from discussing the use of plants for inducing abortions.

> "My mom prodded the figure with a stick and we saw the body [fetus]... Later it was found out who had dumped [aborted] the fetus in the river…a woman [in town] was pregnant but never had the child... My mother reported the discovery of the fetus and it was connected back to the woman … she was arrested." – L.

A story sharer spoke about an experience where a woman may have induced an abortion in secret. The consequences of discovering an allegedly aborted fetus display precisely what keeps this practice and knowledge private. A woman within the story sharers' hometown was pregnant and never gave birth, and a seemingly developed fetus was found and connected back to this woman. Considering their town at the time was very small, it was not difficult to trace who it could have been. Based on the description of the fetus's development it may have been as early as 11 weeks. This individual chose to induce in private and still faced the repercussions feared by most

The taboo and legal nature of plant-based abortions, according to story sharers, adds negative connotations to this cultural practice and forces those practicing it into the shadows without familial support. Overall, this hinders the dissemination of knowledge and influences the cultural value of ethnobotanical abortions. Despite this barrier between disseminating abortifacient knowledge, all story sharers were able to recall ethnobotanical abortions existing within their lifetime in their hometowns or within their social circles.

“Rue, Epazote, and Oregano. They would warn us not to eat [ingest] them when we were pregnant. They would cause your child to come early [abort]...The granddaughter of my brother was pregnant … I don’t know what plants she used but her grandmother told her what to drink to throw it out [induce abortion]. And she didn’t have the baby." – H.

Each story sharer, regardless of their specialization, could identify plants that induce abortion and explain how they are prepared and administered (Table 1).

“I’m … well-rounded with healing herbs … But they do exist! My mom would say Ruda is one. It’s that plant that has a strong smell…they would put Ruda in the tea, and they would give it to women (who wanted to induce abortion). So even if you are having relations, you could take it right before for a similar effect.” – C.

Existing phytochemical studies support story sharers' knowledge. Phytochemical studies are not needed to prioritize healers’ consensus; however, they are helpful in beginning to erode the labeling of medicinal plants as placebos. All plants mentioned in this research exist in prior literature that states they are known to trigger abortions in humans (Table 1).

3. Benefits and Costs

After analyzing data for any patterns among story sharers, the narratives individuals shared conveyed a series of pros and cons to plant-based abortions that influence an individual's decision to pursue a plant-based abortion as well as how

plant-based abortions are viewed from the viewpoint of those that have not had an abortion (Figure 1).

4. Self-autonomy

All story sharers agreed on the fact that self-autonomy is a large benefit of plant-based abortions. Despite personal opinions on abortions, story sharers stress that plant-based abortions provide a person with the choice over their own body.

> "Each woman has their own rights to their body. So that decision [plant-based abortion] is only personal; it's not religious or political."- H.

> "I do feel independent because I am doing this by myself, and I don't need help from a doctor. And I don't have to pay a substantial amount of money." - X.

Some story sharers cited access to an abortion option that would be most affordable for them. Others discussed that the physical act of preparing an infusion themselves to ingest was empowering, considering they could do it on their terms without a physician.

5. Avoiding Medical Barriers

Another benefit story sharers discussed relates to avoiding or bypassing medical barriers that individuals face when seeking abortions. Story sharers discuss that it is common to face doctors who question or refuse requests related to family planning without consultation with a woman's husband or male partner.

> "if the doctor doesn't want to help women, they have to find a way because the doctor is not going to support the child…if they know how to use the plants [abortion inducing plants], they can do it [themselves]" - H.

Although abortion is decriminalized and legalized in California, according to story sharers, barriers within the medical system are still encountered regarding abortions. These barriers included physicians refusing service, wait times, and financial costs.

6. Privacy

Lastly, story sharers all stressed that privacy was something associated with ethnobotanical abortions that was found beneficial. This practice is done with so much privacy that the event is often isolated from family and can go largely unknown.

> "No, they do it [induce plant-based abortions] by themselves [with no family support or awareness]. Hidden." – H.

Story sharers elaborated on the importance of privacy, to have an option where no one has to find out an abortion occurred, particularly family. This connects back to the earlier topic of how the taboo nature of abortion influences the presence of ethnobotanical abortions. In this case, the taboo and stigma previously mentioned can hinder the transmission of traditional knowledge, but also fuel this practice as an option to accomplish an abortion clandestinely.

> "Usually, I am alone. I remember the first time [my partner] would check up on me…but I said I would be fine…one of the [other] times I did have to call [redacted] to bring me a heating pad because the pain was there. So [they] brought me a heating pad and I was shaking because it hurt. But…everything else I just did by myself and it didn't really affect me and I was fine. " - X.

Some story sharers expressed privacy as something they preferred, even when familial support was available. On the other hand, the majority of the cons tied to ethnobotanical abortions are rooted in a lack of knowledge in terms of administering plant-based abortions and the lack of abortion aftercare.

7. Generational Knowledge

Knowing the difference between the amount that is enough to terminate a pregnancy and the amount that may poison you is crucial and can be a downside to plant-based abortions if you are not aware.

> "I think they're safe if you know how to use them and which ones to use. Back then, people that know how to use them, tell us how to use them so we can be safe." – H.

Story sharers highlighted extensively the significance of socio-cultural ties to this practice. Having generational knowledge, in these situations determined the level of safety for plant-based abortions. This highlights the importance of not taking a practice from its roots, considering generational knowledge that makes this process safe takes generations to build and safely transmit.

> "Cause you know if you constantly use something like that [plants for an abortion], you could get hurt… without the proper knowledge. But that's the thing culturally." - X.

8. Abortion After Care

Inducing an abortion with plants may start the process of terminating a pregnancy but may not ensure the safe and complete removal of embryo material that can later cause

illness. Plants utilized to induce the abortion process often induce menstruation, soften the uterus, or provoke uterine contractions. Although these plants are used with the intention of evacuating the contents of the womb, preparative care and post-abortion care are needed. These preventative measures are aspects that come with generational knowledge tied to the abortion-inducing process with plants.

> "After using medicinal plants [for abortion], women sometimes have to go to the capital (Mexico City) if there is something in their womb left making them sick." – L.

9. Plant Taxonomy

Aside from the pros and cons revolving around the ethnobotanical abortion process, story sharers discussed the specific plants that are used most. Multiple story sharers discussed using *Ruta graveolens*, *Lippia graveolens*, *Chenopodium ambrosioides*, and *Salvia rosmarinus* (Table 1). Each of these plants was utilized by boiling the leaves and ingesting the prepared infusion.

> "Three plants very strong for [abortion] are rosemary, rue, and oregano…using these plants for abortion leaves marks-stains… I saw this in neighbors and people in our town who would try to do it in secret." –L

Specifically, *Lippia graveolens* (Mexican Oregano), was a plant that presented some historical discrepancies. Within the literature, there is an inconsistency between Mexican Oregano and European Oregano, which are different species coming from other plant families. Some literature based on surveys claims that Mexican communities utilize

European Oregano to induce abortion (Ciganda and Laborde, 2003). However, literature, including interviews and phytochemical data, point to Mexican Oregano as the primary source (Lin et al., 2007). All my story sharers verified the texture, smell, and look of the oregano they knew to induce abortion that aligns with Mexican Oregano. This situation speaks to the possibility that there has historically been a disconnect between researchers and story sharers when identifying plants.

Discussion

Taking in all the different themes discussed in the findings, it is evident that there are interlocking social and cultural dimensions that drive the retention and existence of the vast knowledge Mexican migrant women hold regarding ethnobotanical abortions. Story sharers hold knowledge of what plants are used, how they are used, and the many cultural facets that encourage, drive, or deter plant-based abortion practices. Interestingly enough, as stated previously, the same topics such as gossip can serve as a double-edged sword to either drive ethnobotanical abortions further or crack down tighter on instances. Overall, ethnobotanical abortions are commonly used within the medicinal plant realm. It is significant to note that all story sharers, regardless of their occupation or social group, had at least one story to share about their experiences undergoing or being within supportive proximity of an ethnobotanical abortion.

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Figures and Tables

Pros	Cons
Feeling of autonomy	Induces abortion but does not complete abortion
Avoid Medical Barriers	Can be unsafe if quantities are incorrect or unknown
Privacy	

Figure 1.1: Includes the pros and cons of story sharers data regarding plant-based abortions. All story sharers expressed individually each of these positives and negatives when discussing ethnobotanical abortions.

Common Name	Family	Scientific Name	Plant parts	Administered	Healers Consensus (%)	Documented in Literature
Rue	Rutaceae	*Ruta graveolens*	Leaves	Infusion orally, In oil vaginally	100	Induces abortion as emmenagogue meaning it stimulates menstrual flow. (Zamora-Martinez & de Pascual Pola, 1992)
Mexican Oregano	Verbenaceae	*Lippia graveolens*	Leaves	Infusion orally	40	Induces abortion as abortifacient (Lin et al., 2007)
Jesuits Tea	Amaranthaceae	*Chenopodium ambrosioides*	Leaves	Infusion orally	40	Induces abortion as abortifacient (Montellano & Browner, 1985)
Rosemary	Lamiaceae	*Salvia rosmarinus*	Leaves	Infusion orally	40	Induces abortion through anti-implantation effect. Embryo fails to attach to the endometrial surface of the uterus to form placenta. (Lemonica et al., 1996)
Blue cohosh	Berberidaceae	*Caulophyllum thalictroides*	Leaves	Infusion orally	20	Has been used to induce abortion. Compound within plant has an embryotoxicity effect (Romm, 2017)
Black cohosh	Ranunculaceae	*Actaea racemosa*	Leaves	Infusion orally	20	Known to be used for abortions and has benign compounds (Feng et al., 2023)
Mugwort	Asteraceae	*Artemisia vulgaris*	Leaves	Infusion orally	20	With the right dose can induce an abortion and with Commiphora molmol can induce contractions (Isenburg, 2021)

Table 2.1: Includes interview and ethnography data conducted with examples of each plant mentioned in existing literature. Healers consensus represents the percentage of story sharers that have documented the use of a given plant.

Chapter 3

Exploring the Socio-cultural Significance and Taxonomy of Abortion-Associated Flora in Michoacán's Indigenous and Mexican Communities

Abstract

Using interviews, ethnography, and plant collection, this study explores the socio-cultural and taxonomic aspects of the long-standing practice of using plants for inducing abortion. The focus of this work centers on communities across Michoacán where abortion for a long time was illegal and continues to be stigmatized. Despite the improving legislation on abortion access across Mexico, abortion remains deeply stigmatized within communities. Currently, individuals can choose to induce an abortion through a medication option at home or a clinic-based procedural abortion. However, the use of plants for abortion aligns culturally and spiritually with specific individuals, particularly among Indigenous communities where this practice has deep historical roots. Through fieldwork, I learned from midwives, herbalists, healers, and community members with differing medicinal plant skill levels. With the guidance of story sharers involved in interviewing and collecting herbarium voucher specimens, we pinpointed 13 commonly used species rooted in nine families. Our findings convey that there is a complex network of transmission for abortifacients that is maintained by interest and generational knowledge but also guarded due to fear and stigma. Furthermore, our results also explore an insight into the individual decisions to abort with plants and the social and cultural benefits it allows. Overall, this botanical practice was widely recognized by

all individuals across different groups in age, gender, medicinal plant skill level, occupation, or stance on abortion.

Introduction

1. Background

This work began during a time of particular social turmoil following the initial COVID-19 lockdown. Mexico, in particular, saw increased occurrences of gender violence and unwanted pregnancies. A recent study revealed that between 2015 and 2019, 54% of all pregnancies in Mexico were unintended, and 51% of all unintended pregnancies ended in abortion (Bearak et al., 2022). In societies where herbal medicine is still widespread, within the decision to undergo an abortion, there exists the option to utilize plants, either alone or in conjunction with medication. Unfortunately, very little is known about the use and success of this process. The only worldwide statistic known on herbal abortions is from the World Health Organization which states between 2010 to 2014, 14% of abortions were performed by introducing objects into the uterus or using plants. In general, it is crucial to recognize that:

"The cases which have been recorded tend to be the worst ones, in which medical intervention has been urgently sought" (Tisserand, 2013).

The rise in unwanted pregnancies and the underreported nature of herbal abortions leaves a vast gap in knowledge of abortifacient use. This is highly significant in towns within Michoacán that not only face legal, but also social barriers to carrying out an abortion, and have a long history of medicinal plant use in all aspects of their healthcare. In the towns of Michoacán, with the rise in unintended pregnancies, there was

a wave of manifestations, protests, and marches to demand legal and free access to abortion. This demand has rooted itself within the "Green Tide" movement (*La Marea Verde*) that originated in Argentina and made its way throughout South America, Central America, and Mexico. This movement focused not only on abortion access, but also demanded justice for gender violence and rising femicides (Acevedo & Bosio, 2019).

2. Study Area

Our study area focuses on Michoacán, a state in central Mexico that is home to four core Purépecha regions (Figure 1). This region is a hotspot of biocultural diversity that extends past the flora and includes the Indigenous people of these regions, the Purépecha. The Purépecha have lived within Michoacán for at least eight centuries, and they have long history of a self-sufficient agricultural economy that has evolved and continues to evolve to the changing social and environmental climate of the region (Amerlinck, 1995).

It is significant to note that each of the four regions has its unique landscape. The Cañada de los Once Pueblos region rests in the northern area of Michoacán and is home to the towns of Chilchota, Ichán, Carapan, Tacuro, Huáncito, Urén, Acachuén, Tanaquillo, Santo Tomás, Zopoco, and Etúcuaro. Due to proximity and interest from participants, Tangancícuaro was included within this region for interviewing and ethnography methodology. The Meseta Purépecha region contains mountainous areas populated by the towns Charapan, Cherán, Nahuatzen, Nuevo Parangaricutiro, Paracho, Tancítaro, Taretan, Tingambato, Uruapan, and Ziracuaretiro. Positioned north of the Meseta Purépecha is the Ciénaga de Zacapu region, home to the Nahuatzen mountains

and the Zacapu Lake. Lastly, there are a series of 13 towns surrounding the central lake, Lake Pátzcuaro, within the Zona Lacustre region. All four regions that are home to the Purépecha have a rich cultural history and current culture that is not limited to a well-known agricultural economy, but a diversity of plant-based practices ranging from creating crafts with vegetation (Maldonado & Voeks, 2021) to traditional medicine that incorporates plants.

Traditional medicine within Purépecha communities includes a wide range of specialties ("P'urhépechas – Etnografía,") like general healers that are known as *curanderos* (Purépecha: *tsinájpir, xurhríjki, eshperi*) who treat physical and spiritual ills. There are also birth workers or midwives known as *parteras* (Purépecha: *pikurpiri*) that will be a central focus of this research. Secondly, some healers, known as *sobadoras* (Purépecha: *parhíjpiri*), focus on massaging the body. Thirdly, within traditional medicine are shamans known as *brujos* (Purépecha: *sïkuame*) who focus on spiritual ills that can also manifest physically. In addition to this, there are also bone specialists known as *hueseros* (Purépecha: *sesiatsintaniunicha*, *jutururuntaniuni*) who focus on bone and joint health. Following this, some herbalists specialize in plant use for healing known in Spanish as *hierberas* (Purépecha: *uitsákuamítiasti, uitákuajamantspini*). Lastly, there are traditional medical specialists, such as *mollereros* (Purépecha: *ukata*). Although parteras were the central focus of the interviewing process, I also included perspectives from curanderos and hierberas.

3. Hypotheses and Scientific Questions

By integrating qualitative and quantitative approaches, this research explores ethnobotanical abortions, appreciating their holistic nature and reconciling what is perceived as Indigenous knowledge with Western science. The qualitative aspect of this study focuses on shared narratives and ethnographic observations, conducted with specific hypotheses and scientific inquiries guiding the research process. Two hypotheses can be posed about this subject:

(H1) The current holders of knowledge for plant-based abortions are individuals within the present reproductive justice movement, La Marea Verde, who serve as abortion accompaniment and can connect through social media or word of mouth to provide support.

(H2) This botanical practice is constantly evolving, informed by the region's continuously changing social and cultural landscape.

To test these hypotheses, we pursued two leading research questions:

(Q1) How common are ethnobotanical abortions within the medicinal plant use realm?

(Q2) Are traditional Purépecha communities still reliant on and retaining this practice? And, if so, now it is transmitted?

Quantitative methods delve deeper into the results of qualitative research by analyzing the taxonomy and distribution of plants discussed in interviews and ethnographic narratives. Within the scope of our current study, we have outlined three hypotheses for examination through quantitative techniques.

(H1) Taxonomically, medicinal plant selection is non-random: Plant species used in abortion processes tend to concentrate in taxa with recognized abortifacient properties. (H2) Plant distribution and accessibility influence which species are primarily utilized. (H3) Plant distribution of the most commonly used species is concentrated within and around local communities.

Materials & Methods

1. Qualitative Methods

In delving into the taxonomic aspects of abortifacients, I leveraged findings from an extensive literature review on plants reportedly used in Mexico. This allowed me to generate inquiries and compile a visual catalog of plants, which I then used to prompt participants for identification. This photo roster of plants is particularly crucial given the differences in folk taxonomy between different regions of Michoacán. Moving on to investigate the socio-cultural components of ethnobotanical abortions, I constructed semi-structured interviews along with in-depth ethnographies. Questions for the semi-structured interviews were created with a feminist focus on digging deep into the emotions and narratives behind this plant-based practice as opposed to solely the logistics of using plants to induce abortion (Appendix A). The semi-structured format of the interviews allowed for an evolution of questions to occur as interviewees shaped the direction of the discussion. Interviewees in the context of this study are therefore seen and treated as story sharers and conversation partners who can pivot or direct the interview process just as the interviewer. By allowing flexibility and giving story sharers autonomy over the conversation during the interview, trust building can better occur,

which is particularly significant given the often taboo nature of abortion in local communities within our study area in Michoacán. Additionally, the continuous evolution of questions and, by extension topics discussed further worked to enrich each interview.

Interviews were conducted with three social groups containing participants from different age ranges and across genders. The three social groups consisted of midwives, herbalists, and community members. While midwives were all female-identifying, herbalists and community members identified as male or female. Community members include individuals who work as community organizers, general community members with varying occupations, and Marea Verde activists. In addition to interviewing, in-depth ethnographies were conducted with herbalists, healers, and midwives who actively use medicinal plants for reproductive care. Ethnographies consisted of shadowing, learning, and/or a combination of actively participating in medicinal plant remedy preparation. Overall, participants for both ethnographies and interviews identified as Indigenous Mexican or Mexican.

2. Quantitative Methods

After processing and analyzing data from interviews and ethnographies, I identified the folk taxonomy for plants used in inducing the abortion process with the help of herbalists, midwives, and community members. After investigating their Linnaean taxonomy and collecting specimens, I focused on the 13 most commonly utilized plants. Considering there are plants with the same name and medicinal use but with different species identities in Linnaean taxonomy, I collected specimens for herbarium vouchers to verify the taxonomic identity of the thirteen most used plants.

Duplicates of each plant specimen were collected so one copy would be submitted to the *Herbario Regional del Bajío* at the *Instituto de Ecología* (Institute of Ecology) in Patzcuaro, while the second copy was deposited at the Herbarium of the University of California, Riverside.

In addition to the qualitative data collected regarding the taxonomy and distribution of plant species, notes of plants observed in forested areas were substantiated by existing databases adjoined by The Global Biodiversity Information Facility (GBIF). Existing data from iNaturalist and various government and non-government organizations of Mexico were compiled to produce an interactive map accessible to the public. GBIF-acquired data underwent filtering to emphasize geospatial plant species information specific to Mexico. The CSV files containing plant species information and observations were imported into the ArcGIS online platform, alongside state shapefiles to delineate clear boundary lines for the study area, Michoacán. CSV files contained GPS coordinates, the date of observation, the organization that collected the data, and the individual that verified the plant's taxonomy. Overall, we anticipate the narratives shared by story sharers will be reflected in the interactive map. Specifically, we expected to observe a pattern indicating the accessibility and distribution of the most commonly used plants within the communities.

Results

1. Social Network of Abortifacients

Story sharers within this work have painted a complex web of social interconnections that sustain the system that transmits, retains, and safeguards

generational information on plant-based abortions. There is a hierarchy of medicinal plant skill use within social groups in which each group has a distinct role within the grander social network of plant-based abortion use (Figure 2).

The story sharers who hold the most crucial insight and experience into plant-based abortions are midwives. This is contrary to our initial hypothesis, that abortion companions, as part of La Marea Verde, primarily hold this knowledge. For further context, midwives specialize in providing reproductive healthcare for individuals of all ages, not limited to childbirth, and often incorporate traditional treatment methods such as the use of medicinal plants. It is particularly significant to unpack the fact that our hypothesis was incorrect. Most people in communities that have midwives in their spaces assume midwives confine themselves to birthing practices, either helping women get pregnant, maintaining a healthy pregnancy, carrying out the birthing process, and postpartum care. However, this is far from what all midwives do. Midwives play a central role in reproductive rights, including all aspects of sexual health like contraception and abortion access.

> “They [story sharers’ family] made comments like "Oh the feminist of the family is going to become a midwife," and I just thought "of course, it has everything to do with that!" And so I wouldn't tell them anything. But I think there is this perception that midwives can’t do things other than help bring a kid into the world. They can accompany abortions and also accompany all gynecological processes. So I think the mentality of people is very closed. People think if you

> are going to bring life, how can it be possible that you would be willing to take that life." - B.

One story sharer delved deeply into their perspective on abortion and midwifery, highlighting how much machismo perpetuates harmful traditions, like barring wives from seeking medical care at clinics, ultimately driving demand for midwives, as they are perceived to be trustworthy since they focus solely on childbirth.

> "Here, the [gender] violence continues to exist in a magnitude. That is also why I think that midwives are a good option... And maybe that's why they have maintained this to this day; maybe even the machismo has supported the existance for midwifery. When a man is machista, and a family is machista, because the machismo is not just something with men; it is a form of being and living that spreads to the other family members. The wife who adopts those ideals transmits and her daughters and her sons…So when someone is going to have a child, the man doesn't want the woman to be seen by a male doctor. The man says to instead go to a midwife who is very good and has faith that she will save the mother and baby... So I think this grew the existence of midwives because sometimes women were not permitted to see doctors [by their husbands or family]." - M.

In this case, midwives can safeguard an option for abortion access that can work around machista traditions that can limit a woman's choice to abort under threat of gender violence and deviating from familial expectations. A particular narrative that displays this threat of violence rooted in machismo is an experience shared that elaborated on a woman who looked for contraception behind her husband's back. A core pillar of

machismo that has always existed within family structures is the need for men of the household to father multiple children and for their wives to bear all the children they can.

> "She was 28 and she had 9 kids, two of which were stillborn and wanted to stop. So behind her husbands back her sisters snuck her to a female doctor to get an IUD. They asked the doctor to cut the strings so her husband wouldn't find out. But when she was 35, her husband took her to the doctor because she wasn't getting pregnant anymore, and he still wanted more kids. She was so scared that the doctor would tell her husband what she did and you can imagine what would happen if he found out. And so she talked to the doctor about this and he just stated to her that he would not share anything with her husband she did not agree with ." - A.

Although this experience is not tied to abortion it presents a perfect example of how machismo restricts women, in particular, their autonomy and reproductive rights outside of the legislature. Situations like this are where midwives are particularly crucial in presenting an option for women to make reproductive decisions while safeguarding their decision and further safeguarding the abortifacient knowledge that is often involved in the process.

Following midwives, healers and herbalists specialize in holistic approaches to healing involving plants. In this context, we use the term healers as an umbrella term that includes individuals other than midwives who offer treatment for physical, mental, and spiritual ailments. Treatments from healers often incorporate plant products, but are not limited to only plants. Herbalists focus solely on medicinal plants for various of health

issues, either as a profession or for day-to-day use for themselves and people in their social circles.

Following healers and herbalists, we have community members who use medicinal plants daily for themselves or seek out traditional treatments with plants from healers, herbalists, or midwives. Community members can include abortion companions, reproductive rights activists, community organizers, or overall community members with varying occupations. Regarding these different social groups, multiple levels exist concerning the depth of knowledge about medicinal plants and their proximity to abortifacients (Figure 2).

According to story sharers, there are several modes of transmission for abortifacient use knowledge. Although we now understand the social groups that hold this knowledge and the differing experience levels (Figure 2), how is this information passed on across generations? Each story sharer unpacked the way they inherited or learned knowledge on abortifacients.

Around 81% of story sharers expressed that their plant knowledge was inherited. Traditionally, the transmission mode is passed on from mother to daughter or father to son. However, in reality, story sharers show that there are often deviations from this flow of knowledge. A particular story sharer, through memory work, realized there was an interruption in generational knowledge between her mother and herself. In this context, the generational knowledge her grandmother passed onto her mother was not passed on to her by her mother. Instead, this story sharer recovered this traditional knowledge on

her own and incorporated new knowledge from her current social circles to carry out her plant-based abortion.

The other percentage of story sharers learned from non-familial mentors or friends and often continued to pass on their knowledge they learned to their family members, such as daughters (Figure 3). A particular story sharer expressed that although traditional plant medicinal knowledge has existed in his family for generations, he learned from a non-familial mentor. This individual currently works in the local farmers market selling plants with his daughter and granddaughter, who have now inherited his plant knowledge.

> "I don't know how to read or write. But I have a lot of traditional knowledge. I grew up learning and working with these plants and can tell you what a plant is and what it is used for just looking at it or smelling it. I learned when I was working for a man who sold plants when I was six years old. He would collect plants from the forest area. The practice of medicinal plants goes very far back in my family and here (Patzcuaro) farther than I can even remember." - J.

In addition to learning primarily from a non-familial mentor, several story sharers elaborated on how they may have learned medicinal plant knowledge from non-familial mentors or family members. Regarding abortifacients, some of them learned this information when they reached their early teens. In these cases, story sharers learned abortifacient knowledge through gossip from friends that did inherit this knowledge from family members.

It's crucial to highlight that within the realm of abortifacients, gossip plays a multifaceted role: it enhances individuals' traditional knowledge in creating and feeding any demand for knowledge while simultaneously posing a potential obstacle. Gossip, or even the mere prospect of it, can impede individuals from seeking information or resources regarding plant-based abortions to avoid the social consequences of their community discovering their plans. On the other hand, gossip about an individual's situation surrounding their pregnancy may push them towards ethnobotanical abortions. A story sharer explained social stigma as a core reason for her to pursue a plant-based abortion.

> GMA: In terms of plants, have you known of or used any plants to interrupt a pregnancy?
>
> E: I only know that rue in tea can cause an abortion. Long ago, when I was studying, I got pregnant by a man who was already married to someone else. For a lot of reasons, I chose to have an abortion.
>
> GMA: Could you tell me a little bit more about the reasoning that led you to have an abortion?
>
> E: Well, for one, the father of my child was with someone else, so my child would not have had a father. My parents were also very strict, so they could never find out what happened. I was also scared of the social consequences that my child would be bullied for not having a father or not having parents who were married.

Despite the existing social network utilized for securely gaining access to ethnobotanical abortions, there are consistent barriers, like gossip, that may hinder access across social groups.

2. Barriers to Ethnobotanical Abortions

Story sharers were asked to explore the many barriers they or others experience when pursuing an ethnobotanical abortion. Many shared lived experiences, unpacked their viewpoints, and often a combination of both through memory work by recalling memories and current opinions. It is significant to note that many barriers to reaching ethnobotanical abortions may serve as catalysts for obtaining an ethnobotanical abortion for other individuals.

For example, the prevailing consensus identified social stigma as the primary obstacle to pursuing a plant-based abortion. Social stigma has also been discussed as a driving force to pursue a plant-based abortion to avoid the stigma of being an unwed mother. Around 54% of story sharers stated that social stigma served as a barrier to seeking the abortion process. Story sharers utilized words like gossip, guilt, shame, and taboo to express the immensity of social stigma faced (Figure 4). In smaller communities, gossip was brought up as a particularly recurring factor. Story sharers expressed the difficulty of being able to pursue an abortion in secret, considering that people in small communities are closer-knit, with communication flowing quickly between neighbors, family, and friends. The guilt and shame discussed relate to the overall social stigma for story sharers, sometimes rooted in societal expectations to always carry out a pregnancy. For others, this guilt or shame is rooted in gender roles and gender expectations at the

family home level. These feelings of guilt and shame, followed by the fear of gossip, tie back to the fact that abortion as a whole with or without plants, according to story sharers, is a taboo topic. According to story sharers, abortion is usually seldomly discussed and, if so, only within certain social circles, sometimes in the form of gossip about someone carrying out an abortion.

> R: It [abortion] is not very much talked about here in the town. It isn't well talked about, outside of the town probably. In bigger cities it is more heard of and talked about. At least here it is still not something that is openly talked about. Why we hear that is that we usually hear through news outlets that women in cities like Mexico City are practicing abortions... Here, it is not heard of.
>
> Interviewer: Why do you think that it is very heard of in Mexico City and here it is not?
>
> R: I think that here that is the case because of fear of what people will say. Like they [people who choose to have an abortion] are scared of people knowing and gossiping even if you went somewhere else to do it. Here, it's not heard of being practiced, but in Zamora [nearby city 10 mins away], absolutely.

Following this, about 33% cited safety as a barrier, more specifically, the danger, uncertainty, and lack of confidence they have when pursuing an ethnobotanical abortion. As mentioned earlier, gossip can play a role in disseminating information on abortifacients. Transmission of this information from word of mouth detached from individuals with an advanced level of knowledge can create uncertainty and a lack of confidence if all the information to carry out a plant-based abortion is not known. For

example, if the understanding of dosage, preparation, and administration is not clear and performed by an individual without knowledge and experience, it can create a dangerous situation. The most common fear relating to possible danger is bleeding out. The majority of story sharers cited the biggest fear as incorrectly inducing a plant-based abortion could cause someone to bleed out and die.

> Interviewer: Right now, abortion with plants is being classified as just as dangerous as inserting sharp objects into the uterus. Do you think this is true?
>
> T: Well yes actually if you think about the possibility of a sudden hemorrhage. It does have some sense because if you combine multiple plants into a tea you don't know if a hemorrhage could occur.
>
> Interviewer: Is this very common that you've heard?
>
> T: Women have come to rural clinics with damage already done from taking teas very charged that have caused hemorrhages and tears. It can be dangerous which is why there is also a hesitance of sharing this information because these are plants you can easily get. It also happens that some women don't successfully abort and now need to deal with something being left in the womb. If something gets stuck inside an infection can occur and cause more deaths. There are so many deaths related to this because there are not cautions or conditions. Abortions to be safe need to occur with the accompaniment of someone professional. And I do not mean professional by title. Someone who has experience with the plants and can follow through with you during the process. Someone who can know what to look out for.

Aside from safety, 26% of story sharers discussed how religion like Catholicism and Christianity play a crucial role in creating barriers by instilling guilt and shame around abortions. Catholicism and Christianity play a significant role, particularly in small communities like Tangancícuaro, compared to denser cities of Michoacán, such as Morelia, with numerous churches spread across community spaces. Most notably, during religious holidays, town celebrations are conducted in large open spaces and parade throughout the town and involve the whole community. The narratives shared by story sharers vividly illustrate the profound influence of religion on everyday life and its significant role in shaping individuals' perspectives. In terms of abortion, story sharers have expressed that abortion is extremely frowned upon and rejected by the church, and by extension, individuals belonging to that faith feel guilt and shame when they deviate from this established stigma. A story sharer who is Catholic recalled their own experience undergoing an abortion; they elaborated on the guilt and shame they felt and still feel. Upon delving deeper into those emotions, the story sharer explained that their feelings of guilt and shame stem from their religious upbringing, which firmly condemns abortion. They were taught to reject abortion and view pregnancy as a gift from God.

Interviewer: What is your overall opinion on abortion?

E: Well I always say your reasons are not my reasons. We don't know what someone's reasons are or what they are going through. But it's not looked good here. As someone who had an abortion, it weighs on me. There is a moral weight that I carry.

Interviewer: Where does the moral weight come from?

E: From our religion (Catholicism). It's something that is not good or bad I think but it is something that affects you always morally.

A quarter of story sharers listed issues of legality as being a barrier due to the fear of incarceration and even being seen as an accomplice for sharing information on plant-based abortions. In this situation, legality can act as a barrier to the abortion provider, abortion companion, and abortion seeker.

GMA: I also wanted to ask about plants that are used to induce abortion. I know sometimes the plants that are used for this are kept secret and not shared. I wanted to ask why you think this is?

L: I feel it is because of all the stigmas that are still around. It is still not accepted 100% that women make the decision to do this (have an abortion). They call us selfish, or a million different things…And you will sometimes run into issues with people that are not open to you having an abortion or you can face legal consequences if you are in a state where it is illegal. And its hard for midwives to work with women in births as it is and it can be even harder for those of us that support women during their abortions. There are some of us that are more open and will support someone during an abortion. But some midwives will say no.

Although the Supreme Court has ruled to decriminalize abortion just last year (Bonifaz and Sierra, 2024), there is still a lot of work that needs to be done to legalize and protect abortion seekers at the local level. After the initial move to decriminalize abortion in 2021, the Supreme Court ruled it unconstitutional to threaten abortion seekers with jail time in Coahuila. Nevertheless, individuals in Michoacán continued to face criminal

charges for abortion (Marea Verde Michoacán, 2022). These individuals were not tried for inducing an abortion; instead, they had murder charges placed against them (Marea Verde Michoacán, 2022). Overall, the intricacies of abortion legality at the local level continues to create a wary feeling in abortion seekers and those that support them.

Lastly, 13% of story sharers discussed repercussions such as gender violence or expectations from family or instilled gender roles rooted in machismo as a barrier. Machismo is a prevalent topic deeply rooted in cultural norms and even practices.

It's important to highlight that all those who shared their narratives were questioned about whether nationwide legalization of abortion would significantly alter abortion access for the better for those in their communities. They unanimously disagreed, pointing out that various barriers, particularly social stigma, would still persist. In order for abortion to truly be accessible, other barriers will need to be tackled at the individual and community level to evolve past abortion stigma.

3. Evolution of Ethnobotanical Abortions

During story sharing with participants, a photographic roster of plants was used to identify potential plants used. Whether story sharers identified certain species or didn't tell us much about how ethnobotanical abortions have evolved. Some plants in our photo roster were cited for being used as far back as 1950 and 1960. Overall, the most cited species did appear in the narratives shared by story sharers. However, story sharers—particularly midwives and herbalists—cited plants that had not previously appeared in the literature. One example of these plants is *Larrea tridenta*, which was one of the most cited plants used or known by midwives and herbalists.

> "The gobernadora (*Larrea tridentata*) is used to induce contractions and menstrual bleeding." - J.

> "There is gobernadora (*Larrea tridentata*) that can cause hemorrhaging. It is also used for interrupting a pregnancy. It can also be used for inducing abortion. This gobernadora also helps with dilation. During births, we use it in tea, and during baths, it brings the bleeding, but usually the bleeding will slowly stop." - R.

This plant, *Larrea tridentata*, is of particular interest because it does not grow within the areas it is being used. It is transported from desert regions of northern Mexico down to the heart of Mexico, Michoacán. This species is a clear example of how the practice of plant-based abortions have evolved to incorporate plants that are circulated within local markets.

In addition to the types of plants used changing with time, the preparation methods have also evolved. Story sharers gave insight into how they prepare plants as abortifacients, typically by boiling the plant in water. However, the logistics of this changes with the resources each individual has. Some story sharers have stoves, pans, and even weights; on the other hand, others report having more limited resources and using metal buckets and matches. The preparation approach most documented in the literature also focuses on boiling plant parts in water. However, midwives have corroborated the use of abortifacients prepared in herbal baths. A notable difference that story sharers have noticed is herbalists' knowledge level. Some herbalists who own shops dedicated to selling plant mixtures have noticed they have become too dependent on prepackaged

mixtures for some ailments. Some story sharers have considered themselves less knowledgeable than the generations behind them.

> "Before, my grandparents knew so much about how to use each plant, but now we depend on the packaged plants, with their uses already in them. My father learned from my grandpa and it goes back more than 50 years our knowledge. But starting with my brothers and I, we've become more dependent on the prepackaged plants. It's just easier and more profitable for the business to buy the packaged and dried plants. But it has cost us the loss of knowledge." - E.

The evolution of various aspects of plant-based abortions parallels with the Indigenous roots this practice derives from. Much like the Purépecha community of Michoacán, ethnobotanical abortions are not static; they continuously adapt to environmental changes and evolve to thrive using available resources. This evolution of ethnobotanical abortions has also transformed it into an accessible option through which individuals can seek privacy, autonomy, authority, and a holistic approach to abortion.

4. Individual Decision to Abort with Plants

Story sharing has revealed a notable practice in Michoacán communities where individuals, particularly women, utilize plants for partial or complete abortion processes. This practice serves as a means for them to assert control over their fertility, challenge traditional norms, and assume authority within their households. Many of these cultural traditions are deeply rooted in the history of machismo.

Interviewer: I wanted to ask that if this traditional practice gives women that work from home a sense of authority and power in their home?

A: Yes, yes since we are effectively the ones that cultivate this at home.

In addition to the individual feelings and benefits that come with holding abortifacient traditional knowledge within the home level, there are benefits to the individual at the community level. Despite the disconnect between what people consider to be midwifery work and what it is, midwives are considered leaders of their community that are continuously sought out.

Interviewer: How do you think your community sees you as a midwife?

E: Well in my community, the midwife has a very big role to play. Like a doctor or the person that knows how to cure with their hands and plants. Sometimes in small towns we don't have doctors so people go to the midwife for help. And so there is this profound respect for midwives. The midwife is seen as a leader in the community. But with that comes a lot of responsibility.

Midwives fill a unique role of safeguarding reproductive health remedies that often include abortion while also keeping the trust and respect of their community for assisting in treating a range of ailments. When an individual chooses to pursue or provide a plant-based abortion, it is often not just a transactional process but factors into a woman's status as a holder of traditional knowledge in the home and the community. Taking this a step further, story sharers also viewed ethnobotanical abortions as a practice that instills feelings of bodily autonomy at the individual level. This has been seen to combat the often violent robbery of an individual's autonomy that story sharers have experienced.

Interviewer: Is being able to use abortive plants, could it give them a feeling of independence or autonomy?

I: Totally. I think the word I would use is autonomy, which is a very powerful word. Especially, when it has to do with processes in a woman's body, because the stories of recent years have been like a robbery and like a super violent approach to someone else, especially by men from a place that is hierarchical, paternalistic, and violent. It should have never happened. But it happened. And so yes…it is very important for us to feel that autonomy and that decision when doing anything in our bodies.

It is significant to note that every individual's experience is neither positive nor uniform. Some story sharers highlighted the intense level of privacy associated with ethnobotanical abortions, which extends to an internal realm of secrecy. Essentially, this indicates that the process of plant-based abortion is frequently concealed from the individual undergoing it. To illustrate this point, when some story sharers suspect pregnancy due to a delayed period, rather than taking a pregnancy test, they promptly seek out plant-based remedies to induce menstruation.

"I think most of the women really, have had abortions without really knowing. Why? Because if we noticed out period hasn't come or is late we would just take the rue and have intense menstrual pains that would be the embryo coming out. But we didn't notice because we immediately took the rue without checking for pregnancy." - V.

Ethnobotanical abortions not only offer a distinctive degree of privacy but also hold the potential to challenge harmful traditions, restore bodily autonomy, and defy gender expectations. Moreover, according to story sharers, the use of abortifacients is intricately linked to an individual's religious and cultural beliefs. Plant-based abortions provide an abortion option to individuals seeking an option that culturally and spiritually aligns with their values. Therefore, ethnobotanical abortions are often not just seen as a one-way transaction to story sharers, particularly to midwives.

Midwives have shared that an abortion, much like a birth, is a cycle that requires preparative care, holistic care during the process, and a closing of the cycle with aftercare. Preparative care can include preparing the body to endure the abortion with the use of plants to soften the cervix or calm the nerves with something as simple as lavender oil. During the process, whether it be a full plant-based abortion or a medication abortion accompanied by plants, the main goal is to utilize plants to make the process smoother and calmer. The aftercare can manifest in the form of herbal baths to physically tighten the body using astringents and spiritually close the body using rose petals or calendula petals in baths that are extremely culturally significant to processes of birth and death (Figure 5). The holistic nature of this approach to abortion remains a fundamental reason why story sharers express that there continues to be a demand for plant-based abortions. Story sharers described instances of gynecological violence perpetrated by physicians within Western medicine as a significant deterrent from pursuing any abortion method involving these physicians. Overall, 93% of story sharers shared high confidence in medicinal plants use, while 30% shared high trust in Western medicine (Table 3). This

history of gynecological violence, which in fact spans generations, pushes them towards traditional doctors such as midwives.

> “We got to talking about gynecological violence. And that is gynecological violence, when they do not allow you to make the decision that you feel is most convenient for you.” - A

Although the individual decision to pursue an ethnobotanical abortion for some story sharers is the best option for them when faced with an unwanted pregnancy, story sharers also express caution when using plants. Notably, 49% of story sharers have a medium level of trust with Western medicine (Table 3). Ultimately, there is a strong pull towards medicinal plant use, but still a substantial degree of confidence within Western medicine during emergencies.

> “I once planned to have an abortion with plants. It was very strong the plant that they gave me. It was the most bitter sour taste I have ever tasted. It was very difficult for me to drink everything and in the end, it didn't end up working. So, I ended up having to go to the doctor to help me because I couldn't with the plant. I think maybe it would work better if you take it early in the pregnancy when you are just starting. In my case I was already 2 months along so I think that's why it didn't work because the plants do work early on. I do think it is important for women to have these resources and know what to use even before you become sexually active. That way they go in knowing they have something they can count on not during while everything is happening and time passes.” - P

With or without emergencies, most story sharers highlight the importance of properly identifying the plant you are using and knowing how to use it or reaching out to an expert. In one particular story, the story sharer discussed that some plants look very similar to each other, but one can be toxic while the other isn't.

> Interviewer: Do you think that being able to induce an abortion in your own home with plants can give someone a sense of autonomy or independence?
>
> V: I think the first time at least anyone should seek out the help of a midwife if it doesn't react well in your body. Because not all bodies are the same. If you are alone and don't have the help of someone that knows about plants something bad can happen. After the first time I think it probably would be okay to try on your own. The plants are amazing to use, but if you know how to use them. There are also some plants that look very similar and if you use the wrong one you could be in trouble. If they do something alone in their home it's very risky and you need to go to someone who can know which plants are which.

In this situation, knowing how to properly identify the plant you are using is crucial to your safety. For this reason, this research explored plant identification and folk taxonomy of plants of interest with story sharers and cross referenced with Linnaean taxonomy.

5. Intersections of Folk Taxonomy and Linnaean taxonomy

In total, 34 plants were identified by story sharers. Each plant was recognized as one of three things: Abortifacient, oxytocic, or emmenagogue (Table 1). An abortifacient induces an abortion, but the specific mode of action is unspecified. Oxytocic plants induce contractions that prompt the womb to empty embryonic material (Gruber and

O'Brien, 2011). Lastly, an emmenagogue denotes any plant that induces menstrual flow (Gruber and O'Brien, 2011). In this context, it's crucial to consider the specific physiological effects a plant is meant to have. Folk taxonomy typically conveys taxonomic information and information about a plant's medicinal properties. Of these 34 plants shared, twelve were mentioned repeatedly across different social groups (Table 1).

Among our twelve focal plants, there are resemblances in the folk taxonomy applied to a handful of species, often resulting in shared names attributed to their similar medicinal properties. Specifically, three different plants sometimes share common names based on the region. Based on the region, *Larrea tridentata*, *Montanoa tomentosa*, and *Eupatorium odoratum* are all referred to as variations of Ciguapatle, Chihuapatle, or Gobernadora. *Larrea tridentata* is mainly recognized as Gobernadora, *Montanoa tomentosa* as Zoapatle, and *Eupatorium odoratum* has been exclusively documented under the names Ciguapatle or Chihuapatle. However, moving to different regions, some midwives in Cherán know two different species as Gobernadora, while, across the Patzcuaro Lake region, Ciguapatle or Chihuapatle is used synonymously with *Montanoa tomentosa*. On the other hand, many individuals around the Patzcuaro Lake region do not recognize the term Zoapatle. It is significant to note that many story sharers in the Patzcuaro area have roots in other areas of Mexico outside Michoacán, so we may see a mix of folk taxonomy from different regions of Mexico that happens from transcultural trading at social gatherings and migration. Considering the commonality of shared names among species, aligning the given folk taxonomy with the Linnean taxonomy is crucial, as exemplified in Table 1.

In addition to this parallel approach to acknowledging folk and Linnean taxonomy, story sharers discussed plants through a traditional lens of selecting plants that align perfectly with a particularly well-known ethnobotany theory. Many story sharers discussed how some native plants grow within the area and correlate with the common illnesses that arise in the surrounding community.

> "People… ask me for some remedies to help with a cold or joint pain. The plants here in the area are almost special for curing these problems that happen in the area. When you think about it some of the plants here that are used for the cold will grow in that time when people get colds." - E.
>
> "Some people specifically traditional midwives say you should only use plants that grow in your area. It [preparation of plant-based treatment] can be in a bathtub or not depending on what resources you have or use a bucket if you do not have a tub." - B.

This clearly reflects in part the historically important theory of the ancient "doctrine of signatures," which states that plants that grow in a particular area have medicinal value that correlates with the common ailments of that same area (Bennett, 2007). Usually, this theory applies to plants resembling certain body parts and displaying certain imagery that connects with a specific ailment. Although this theory has been largely refuted and cast aside by the Western scientific community, it is significant to acknowledge and honor the role of this theory within traditional plant knowledge. Studies have reconciled the limitations of this theory as stated by the Western scientific community while paying respect to the theory as either a method of disseminating

information or culturally significant to traditional knowledge (Bennett, 2007; Gaoue et al., 2017).

6. Phylogeny of Species of Interest

In addition to the theory of doctrine of signatures, story sharer narratives and taxonomic analysis of plant species also support the theory of non-random plant selection. The theory of non-random plant selection states that phylogeny influences medicinal plants that are selected, which means, that certain pharmacological products tend to occur more frequently in certain lineages than in others (Gaoue et al., 2017). For the 12 of the most recurring species, I ran a statistical analysis on the commonality of families of species cited against the existing diversity of species within each family. The goal for this was to determine if their commonality is statistically significant. The occurrence of Rutaceae, Zygophyllaceae, and Verbenaceae within story sharers' narratives was statistically significant. The presence of these families among species shared in stories exceeded statistical expectations by more than tenfold (Table 2). Conversely, the occurrence of Asteraceae was significantly lower, approximately one-fourth of the anticipated frequency. This statistical analysis corroborates the theory of non-random selection in medicinal plant usage. Plant species are not selected arbitrarily or influenced solely by the extensive diversity within a family. Instead, they are deliberately chosen based on their medicinal properties that have evolved within phylogenetic groups.

7. Accessibility and Distribution of Abortifacients

In addition to discussing the phylogeny of specific plants, a prominent topic among story sharers was the interpretation of plant accessibility in relation to acquisition methods. Most midwives, herbalists, and healers expressed that their plant collection practices were 30-50 meters away from main highways and streets.

> "This season we collect them [plants] from the *cerro* [mountain forested area]. But 30 meters into the cerro, those plants are on the edge of the road and are contaminated." - J.
>
> "Places like… the side of the highway … aren't as clean … it is not the best idea to take them. Since you don't know how contaminated, they are with pollutants and when people spit… on the side of the road. So, the benefit of having them at home is being able to cut them respectfully and intending to help someone. So, it is more beautiful. So, if we can get a majority of our plants from our homes, that would be ideal." - M.
>
> "Plants need to be collected at least 50 m away from any main roads. Where there isn't trash, dirty water, or cars. To avoid contamination in plants." - E.

There is a widespread belief that plants growing near urbanized areas, highways, and populated streets are contaminated and unsuitable for medicinal use. This concern is particularly noteworthy given the increasing urbanization and the conversion of forested areas into agricultural land (Lazos-Chavero et al., 2021). Overall, story sharers shared

that collecting at home or within 30-50 meters of urbanized regions or purchasing from other herbalists is the best method.

> "I think medicinal plant use is maintained through the generations but because there is a larger population now home gardens have been lost since there is a lack of space. Mostly smaller towns still have these but people still have the option to find plants they need in the markets even if they can't grow them at home anymore." - L.
>
> "We know some women that sell in the markets that come from small towns and sell plants already cut and we know them well." - M.

Due to increasing urbanization, story sharers have expressed generational differences between the home garden space their parents or grandparents had and their own. They discussed that they have often had to turn to other herbalists, midwives, or healers to acquire plants they did not have the space or resources to cultivate.

In addition to the definitions provided by story sharers regarding access to plants suitable for medicinal purposes, the question of proximity and physical accessibility of abortifacient plants within the neighboring communities of Michoacán arises. After compiling geospatial data from existing databases to inform what story sharers expressed, I created an application accessible to the public to identify where plants most commonly used as abortifacients in Michoacán are distributed across Mexico (Figure 6). Story sharers noted that our initial hypothesis, which anticipated the distribution of all commonly used abortifacients among local communities, does not hold true for *Larrea*

tridentata, one of the most frequently used in our study area (Figure 7). The closest observation of this species to our study region is in the northeast area above Michoacán. While many plant species generally conform to our hypothesis by being found in areas surrounding their usage locations, *Larrea tridentata* is an outlier. Story sharers have shared that this species, known primarily as "Gobernadora," is usually transported from drier climates of Mexico and sold at local markets by herbalists. In synthesis, the community-based qualitative insights derived from interviews seamlessly converge with the quantitative data sourced from GBIF, showcasing a strong partnership in understanding the dynamics of Michoacán's communities.

Discussion

The research presented here offers insightful narratives that explore not only the socio-cultural and taxonomic aspects of utilizing plants for abortion but also delve into the underlying motivations behind the demand for and effectiveness of transcultural reproductive healthcare options. This desire for transcultural reproductive care is substantiated through the high confidence levels in medicinal plant knowledge and degree of acceptance for Western medicine discussed by story sharers. As discussed previously, this practice offers an option for individuals to abort on their terms in a way that aligns with their individual choices, often motivated by their culture, political, or social surroundings. As mentioned, midwives view ethnobotanical abortions, like births, as a cycle honoring the preparation and recovery of the whole individual undergoing the process. It is evident from the shared narratives that abortion is not merely a transactional practice, but intersects with various social and cultural practices. It is part of the grander

realm of reproductive healthcare that intersects with issues regarding autonomy, gender violence, traditional ecological knowledge, and politics.

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Figure & Tables

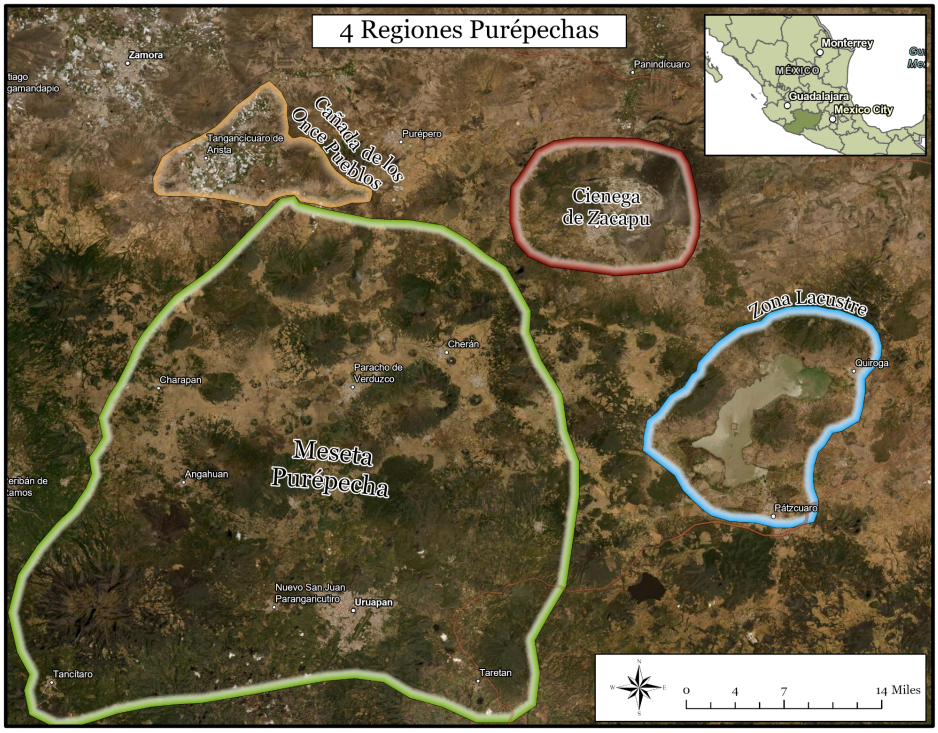

Figure 3.1: Map of the four Purepecha regions that include several communities that were interviewed. Communities interviewed were: Tangancicuaro, Zamora, Cheran, Erongaricuaro, Patzcuaro, Uranden, Huecorio, San Pedro Pareo, TzinTzunTzan, San Francisco Uricho.

Figure 3.2: Infographic demonstrating the different levels of knowledge level of medicinal plants. Midwives have advanced knowledge of medicinal plants and focus on reproductive health and, therefore, are most knowledgeable on the applications of plants for abortion and birth. Healers and herbalists both have an advanced level of plant knowledge. They also have extensive knowledge of abortifacients but tend not to interact with and use the plants to the extent midwives do. Lastly, community members have medium to low levels of medicinal plant knowledge.

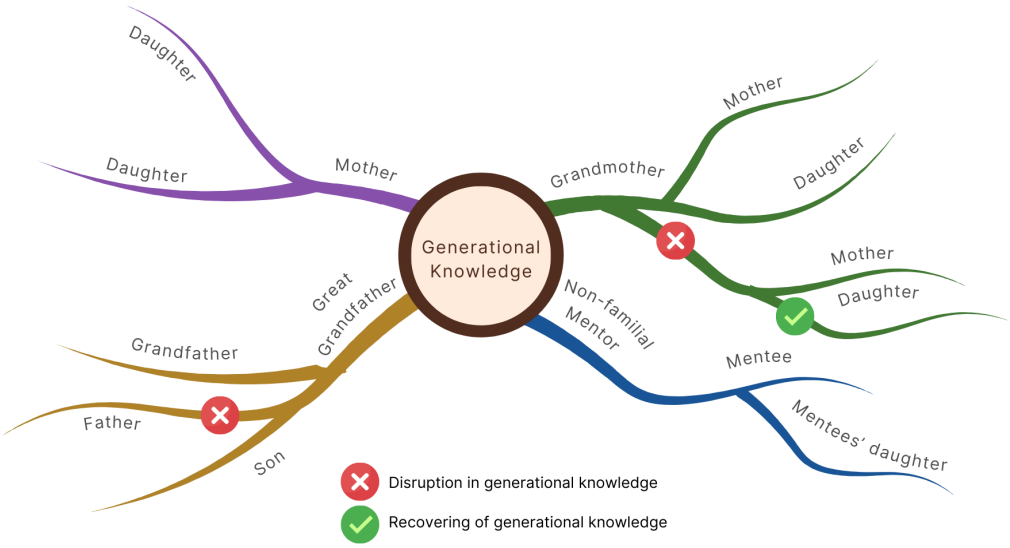

Figure 3.3: Infographic displaying four different types of transmission of generational knowledge, specifically to this study about medicinal plants pertaining to abortion. A red X symbol signifies an interruption of generation knowledge between one generation and the next. In contrast, a green check mark means an instance of recovering generational knowledge despite the interruption.

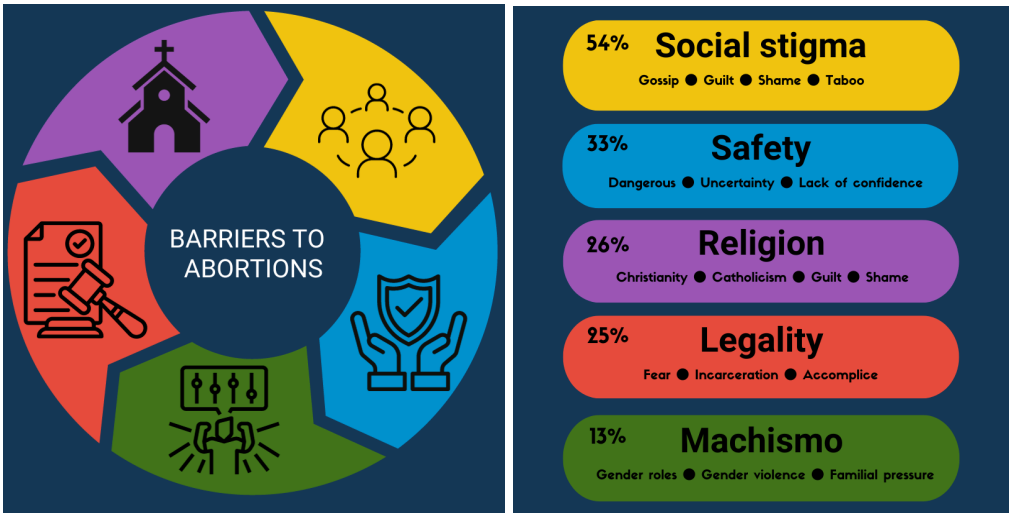

Figure 3.4: Infographic conveying the breakdown of the different barriers individuals face to pursue ethnobotanical abortions. The percentages on each category pertain to the percentage of story sharers that cited that category as a barrier to ethnobotanical abortions. Keywords under the more significant categories of social stigma, safety, religion, legality, and machismo convey the keywords that participants used to describe a narrative or viewpoint connected to the core category.

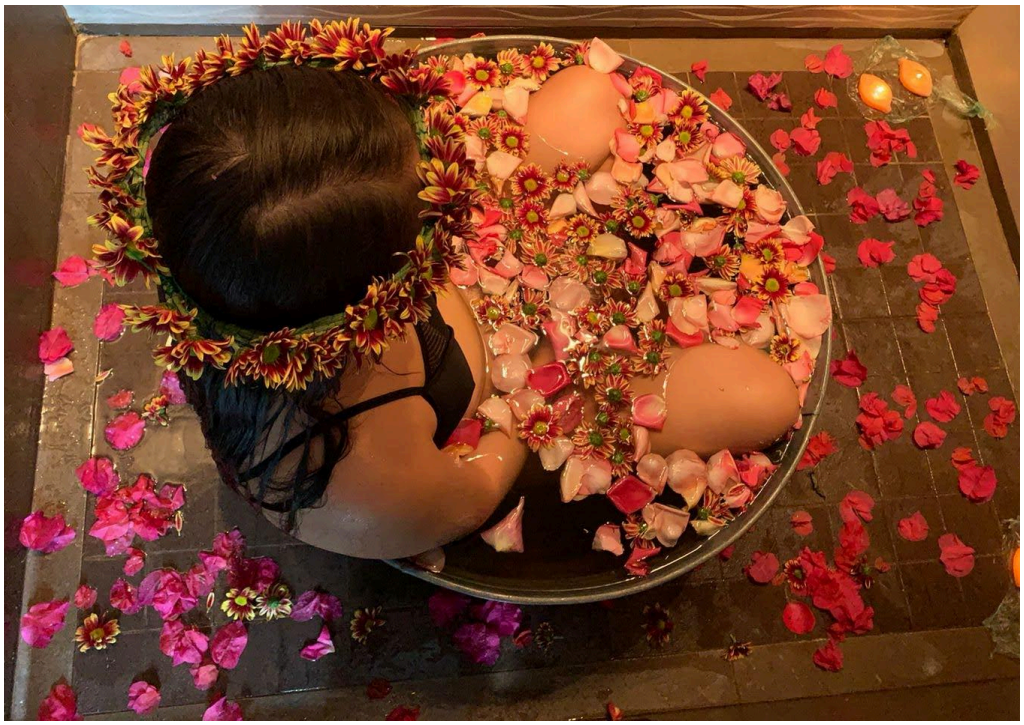

Figure 3.5: Photograph of an example of a postpartum or post-abortion herbal bath provided by Nacer y Renacer, a midwife collective in Pátzcuaro, Michoacán.

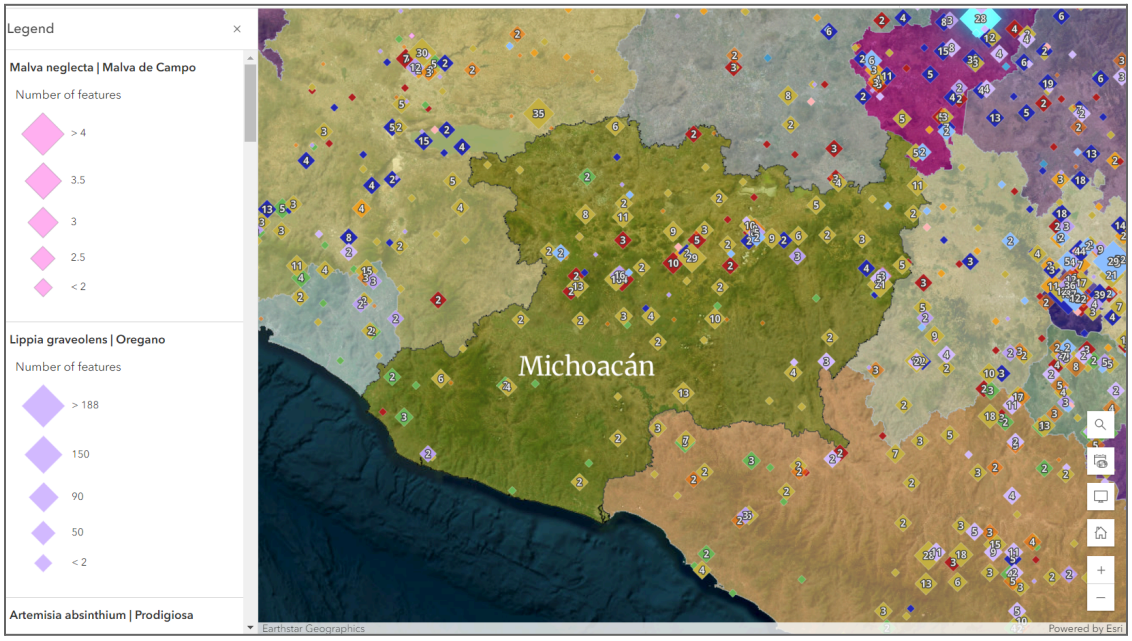

Figure 3.6: A publicly accessible map that conveys the distribution patterns of the 12 most commonly used abortifacients. Clustering was utilized to group multiple documentations within proximity. The bigger size of the diamond symbol signifies a large concentration of the given species. Access to the interactive map: https://tinyurl.com/arcgisabortifacients

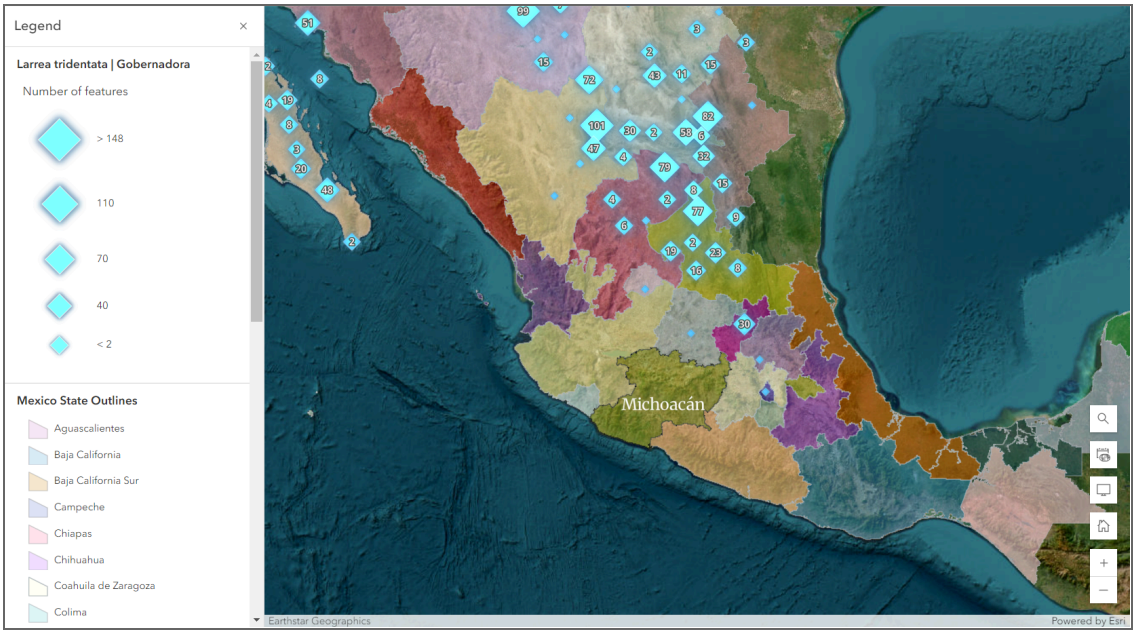

Figure 3.7: The interactive mapviewer was set to filter out all species except *Larrea tridentata* to convey that this species does not grow and has not been recorded growing in Michoacán. Access to the interactive map: https://tinyurl.com/arcgisabortifacients

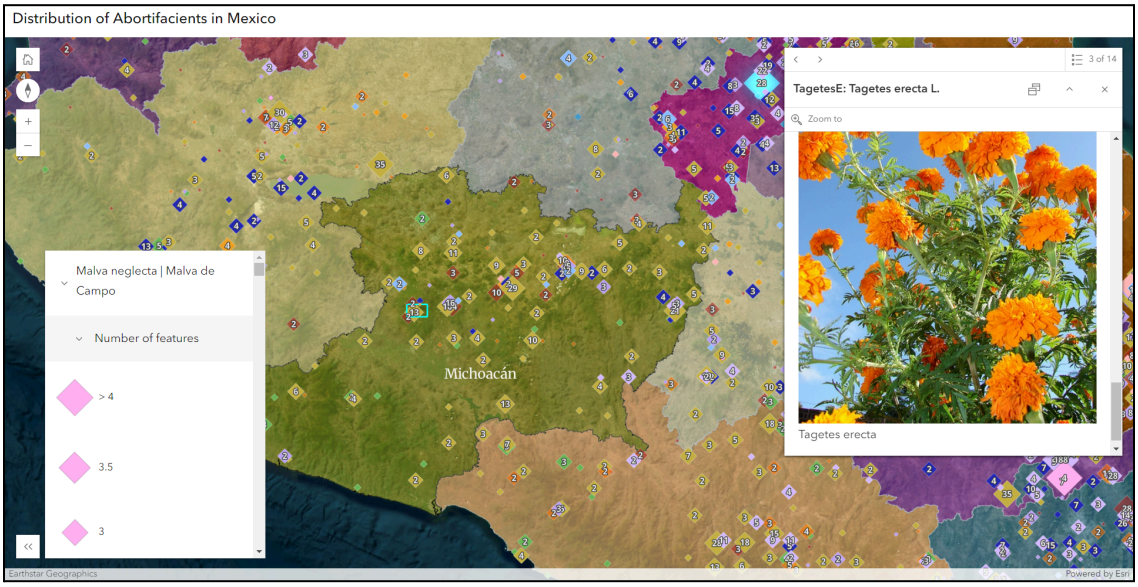

Figure 3.8: The interactive map viewer here, when a viewer clicks on a cluster or point, populates a pop-up feature (seen on the right) that lists the coordinates of the plant and further logistical information. In addition to this information, a photo of the species is available for reference to avoid confusion between overlapping folk taxonomies. Access to the interactive map: https://tinyurl.com/arcgisabortifacients

Spanish	English Name	Scientific Name	Family	Plant Parts	Method	Intended Effect
Epazote	Epazote	*Dysphania ambrosioides*	Amaranthaceae	Leaves	Infusion	A
Angelica	Wild celery	*Angelica archangelica*	Apiaceae	Leaves	Infusion	E
Mil en rama	Yarrow	*Achillea millefolium*	Asteraceae	Leaves	Infusion	E
Prodigiosa	Wormwood	*Artemisia absinthium*	Asteraceae	Leaves	Infusion	A
Calendula	Pot Marigold	*Calendula officinalis*	Asteraceae	Leaves	Infusion, bath	A
Ciguapaztle*	Ciguapaztle	*Eupatorium odoratum*	Asteraceae	Leaves	Infusion	A, E
Arnica	Arnica	*Heterotheca inuloides*	Asteraceae	Leaves	Infusion	O
Manzanilla	Chamomile	*Matricaria chamomilla*	Asteraceae	Leaves	Infusion	E
Zoapatle*	Zoapatle	*Montanoa tomentosa*	Asteraceae	Leaves	Infusion	A
Cempasúchil	Mexican marigold	*Tagetes erecta*	Asteraceae	Leaves	Infusion	A, E
Altamisa	Feverfew	*Tanacetum parthenium*	Asteraceae	Flower	Infusion	A
Peyote	Peyote	*Lophophora williamsii*	Cactaceae	Leaves	Infusion	A
Noche buena	Poinsettia	*Euphorbia pulcherrima*	Euphorbiaceae	Leaves	Infusion	A
Tofu	Tofu	*Glycine max*	Fabaceae	Leaves	Infusion	E
Frijoles pintos	Pinto Bean	*Phaseolus vulgaris*	Fabaceae	Fruit	Infusion	E
Fenogreco	Fenugreek	*Trigonella foenum-graecum*	Fabaceae	Leaves	Infusion	E
Hiperico	Perforate St John's-wort	*Hypericum perforatum*	Hypericaceae	Leaves	Infusion	A
Romero	Rosemary	*Rosemarinus officinalis*	Lamiaceae	Leaves	Infusion	A

Tomillo	Garden Thyme	*Thymus vulgaris*	Lamiaceae	Leaves	Infusion	O
Camphor	Camphor	*Camphora officinarum*	Lauraceae	Leaves	Infusion	O
Canela	Cinnamon	*Cinnamomum verum*	Lauraceae	Leaves	Infusion	A
Laurel	Bay laurel	*Laurus nobilis*	Lauraceae	Leaves	Infusion	A
Ajo	Garlic	*Allium sativum*	Liliaceae	Leaves	Infusion	A
Malva del campo	Cheeseweed	*Malva neglecta*	Malvaceae	Leaves	Infusion	O
Chicalote amarillo	Mexican Prickly Poppy	*Argemone mexicana*	Papaveraceae	Leaves	Infusion	A
Hoja Santa	Mexican Pepperleaf	*Piper auritum*	Piperaceae	Leaves	Infusion	A
Rosa de Castillo	French rose	*Rosa gallica*	Rosaceae	Petals	Infusion	A
Ruda	Rue	*Ruta graveolens*	Rutaceae	Leaves	Infusion, bath	O, A
Floripondio	Angel's trumpet	*Brugmansia arborea*	Solanaceae	Leaves	Infusion	A
Toloache	Sacred datura	*Datura wrightii*	Solanaceae	Leaves	Infusion	A
Cedron	Lemon verbana	*Aloysia citrodora*	Verbenaceae	Leaves	Infusion	A
Verbena	Seashore vervain	*Verbena litoralis*	Verbenaceae	Leaves	Infusion	A
Oregano	Mexican Oregano	*Lippia graveolens*	Verbenaceae	Leaves	Infusion	O, E
Gobernadora*	Creosote bush	*Larrea tridentata*	Zygophyllaceae	Leaves	Infusion	O, E

Table 3.1: This table shows the 34 plant species discussed by story sharers. The highlighted species are the twelve plants that came up recurringly. The species with the asterisk, depending on region, share variations of chihuapatle or ciguapatle derived from the folk taxonomy of the area. There were three types of intended physiological effects for the species. Abortifacients (A) which were generally known to induce abortion. Emmenagogues (E) which induced menstrual flow. Oxytocic plants (O) which induce uterine contractions.

Family	Times mentioned in interviews	Total species	Expected	Residual	p	Significance
Asteraceae	18	32,000	48.7	-4.40	0.0000	**
Malvaceae	1	4,225	6.4	-2.14	0.0161	
Papaveraceae	2	825	1.3	0.66	0.2531	
Rutaceae	34	2,509	3.8	15.45	0.0000	**
Piperaceae	1	3,600	5.5	-1.91	0.0279	
Zygophyllaceae	8	285	0.4	11.49	0.0000	**
Verbenaceae	13	1,100	1.7	8.75	0.0000	**
Malvaceae	1	6,189	9.4	-2.74	0.0030	
Amaranthaceae	3	2,500	3.8	-0.41	0.3401	

Table 3.2: This table shows the families corresponding to the most recurringly used species for abortifacients. The number of times mentioned in interviews represents the number of times a plant species (of the 12 most commonly highlighted in Table 1) belonging to this family is cited by a participant.

Inherited Traditional Knowledge	Confidence in Medicinal Plant Use	Confidence in Western Medicine
Yes= 79%	High= 93%	High= 30%
No= 21%	Medium= 7%	Medium=49%
	Low=0%	Low=21%

Table 3.3: This table illustrates the distribution of individuals who have inherited traditional knowledge and their varying levels of confidence in medicinal plants and Western medicine.

Conclusion

The overarching aim of this study was to explore the socio-cultural and taxonomic aspects of ethnobotanical abortion, laying the groundwork for subsequent biochemical analyses of select plant species, particularly within the context of Michoacán, Mexico. To explore this aim, an undergraduate researcher and I conducted an in-depth literature review and analysis of abortifacients within Mexico. Subsequently, we developed a questionnaire to facilitate interviews and ethnographic research to explore the social and cultural aspects of abortifacient utilization among Michoacán migrant communities residing in California. Afterward, we refined our questionnaire based on feedback and insights from story sharers, preparing it for use within communities in Michoacán. In Michoacán, we conducted comprehensive investigations into the socio-cultural dynamics and taxonomic characteristics of ethnobotanical abortions, employing quantitative and qualitative research methods.

This research uncovered distinctive insights into the progression and present state of ethnobotanical abortions. Although the initial chapter of this work was primarily exploratory, aiming to refine our understanding of the evolution and current state of abortifacients in Mexico. Notably, we encountered unexpected findings, such as the censorship of abortion through restricted terminology use. The second chapter was also exploratory and focused on centering the narratives of migrant Michoacana women in California. Although we anticipated that ethnobotanical abortions would persist through migration, we did not expect the complexity of how this practice evolved to suit the needs

of each individual and accommodate plant availability. Lastly, in chapter three, we formed a series of research questions and hypotheses pertaining to our quantitative and qualitative methods. Our first qualitative hypothesis posits that the holders of knowledge for plant-based abortions are individuals within the reproductive justice movement, La Marea Verde, who serve as abortion accompaniers and can connect through social media or word of mouth to provide support. This hypothesis was incorrect as the primary holders of traditional abortifacient knowledge were primarily midwives, followed by herbalists and healers. Our second hypothesis suggested that this botanical practice is continually evolving, informed by the region's ever-changing social and cultural landscape. Our second hypothesis was correct, considering we observed changes in protocol for ethnobotanical abortions at the individual and community levels. The primary qualitative research questions we aimed to address were: How common are ethnobotanical abortions within the realm of medicinal plant use? Why are communities reliant on and retaining this practice, and how is it transmitted? The qualitative data analysis demonstrated that knowledge and awareness of ethnobotanical abortions permeate deep within general medicinal plant use across all social groups involved in this research. Moreover, a comprehensive investigation delved into the underlying drivers behind the perpetuation of this tradition at the individual level, uncovering that the motivation for engaging in ethnobotanical abortions stems from a blend of social, cultural, and frequently spiritual influences. Beyond the motivational factors sustaining this tradition, its continuity is upheld by a complex social network that disseminates and

protects knowledge, with midwives serving as traditional knowledge holders. In our quantitative analysis, we hypothesize first that the plant species used in abortion processes will be influenced by phylogeny, adhering to a pattern of non-random medicinal plant selection. Our hypothesis was validated through statistical analysis of the plant families utilized, revealing that four families exhibited notable significance. This analysis underscores that plant selection is not random but follows phylogenetic patterns. Secondly, we hypothesize that plant distribution and accessibility influence which species are primarily utilized. Our third hypothesis suggests that the distribution of the most commonly used species is concentrated within and around local communities. Both these hypotheses were correct for all but one of our plant species. One species in particular, *Larrea tridentata*, is absent from the natural flora of Michoacán. Instead, herbalists sourced it from regions situated to the north of Michoacán. Additionally, we found that existing geodatabase data corroborate the distribution of commonly used abortifacients reported by community story sharers.

These findings have implications for local communities where this research was conducted and for academia in ways rooted in a range of fields, including geography, ethnic studies, ethnobotany, plant science, and plant biochemistry. For local communities and the field of geography, the interactive distribution map available to the public will allow anyone to find accessibility and the ranges to plants of interest within Mexico. The results of our qualitative analyses will support ongoing efforts by midwifery collectives like Nacer and Renacer. These initiatives aim to bring reproductive health education to

local communities, combining Western medical options with information rooted in traditional knowledge to offer transcultural healthcare options. Regarding the fields of ethnic studies and ethnobotany, this work informs we know about traditional ecological knowledge used specifically for ethnic groups within Michoacan and those that have migrated to California. Our work goes further to cross-examine quantitative data to support healers' consensus and support the success of plant use within Michoacan communities. Lastly, more knowledge about abortifacients must be gained within plant science and biochemistry. This research sets the foundation for initiating metabolomic analysis by high-performance liquid chromatography-tandem high-resolution mass spectrometry to analyze the chemical compositions of the plants and potentially identify the abortifacient components, which is currently underway.

The strength of our methodology heavily accomplished the range of our research results by integrating the benefits of both qualitative and quantitative techniques. Qualitative methods delve into the complex narratives of story sharers, providing insights into the practice of abortifacient use. In contrast, quantitative methods cross-reference existing data and literature with our qualitative findings. Additionally, our multidisciplinary approach benefits local communities where the research is conducted and has the potential to advance numerous fields of study. There were specific limitations related to qualitative techniques; narratives needed to be freely shared, and several story sharers declined to discuss their abortion experiences. Reasons for this included shame, lack of trust, and the taboo nature of the topic. Building connections between story

sharers and researchers is a lengthy process that varies for each individual. However, the time dedicated to fieldwork could have been improved due to initial funding constraints. Another challenge was verifying the Linnaean taxonomy of plant species. Climate change, which has caused significant delays in the rainy seasons in areas of Michoacán, made it difficult to obtain complete herbarium specimens of certain species in their natural habitats. For this reason, multiple trips to different areas had to be made to secure duplicate and even triplicate voucher specimens for certain species.

For future directions, a metabolomic analysis of the plant species of interest is being conducted in collaboration with Dr. Mario Figueroa from the School of Chemistry at the National Autonomous University of Mexico (UNAM). Future studies can build on the results of this preliminary metabolomic work to further test plant extracts for active compounds responsible for inducing abortion. Beyond metabolomics, future scientific research and community initiatives can leverage this work to advocate for incentives and accessible options in transcultural reproductive healthcare. Lastly, geographical studies can expand on the interactive map developed in this research to analyze historically how plant species distributions have changed over time. This approach can be further extended to examine the evolution of the geographical distribution of plants of interest, considering the impacts of climate change and deforestation of the study area.

Fundamentally, this work updates the foundational knowledge base on abortifacients in Mexico, intersecting socio-cultural, taxonomic, and biochemical aspects. Creating a comprehensive knowledge base requires a multidisciplinary approach to

collecting and interpreting qualitative and quantitative data. This approach yields tangible benefits for local communities in Michoacán and establishes a robust foundation for further research into various aspects of abortifacients beyond the scope of this study. This is particularly important given the ongoing global debates and evolving legislation and cultural perspectives on abortion.