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# TRAVELING CULTURES AND PLANTS

The Ethnobiology and Ethnopharmacy  
of Human Migrations

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# Medicinal Plants and Cultural Variation across Dominican Rural, Urban, and Transnational Landscapes

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## Introduction

Ethnobotanical knowledge evolves as it is exchanged, transferred, and appropriated by people adapting to new surroundings and changing environments (Lee et al. 2001; Voeks and Leony 2004). As people migrate between rural and urban environments, they exchange knowledge, cultural traditions, and medicinal plants. Fixed borders do not exist between rural, urban, and transnational groups, nor do they exist between laypeople and healers, as information is shared through various channels.

Medicinal plant knowledge is important for health care initiatives (Bodeker 1995; Bodeker and Kronenberg 2002) and conservation efforts (King 1996; Balick et al. 2002), yet our understanding of the distribution of plant knowledge within a community or across multiple communities is in its infancy (Campos and Ehringhaus 2003). Ethnobotanical studies tend to understate the variation of plant knowledge by reporting plant use information as homogeneous throughout a cultural group. Ethnobotanical knowledge is diverse and can differ markedly from one individual to another, as well as from one community to another, making it difficult to analyze. Studying cultural variation of ethnomedical knowledge gives insight into the distribution and transmission of plant use information in a community. These studies can help demonstrate the complexities and dynamics of medicinal plant knowledge and offer insight into cultural change.

In addition, a description of these patterns provides a benchmark for future studies to evaluate erosion or acquisition of knowledge over time.

Dominican traditional medicine is not limited to the borders of the Dominican Republic, as New York City has a growing Dominican community that continues to maintain traditional healing practices (Balick et al. 2000; Reiff et al. 2003). When Dominicans immigrate to New York City, they continue to use traditional medical practices. Twenty-four percent of Dominicans surveyed in New York City emergency rooms in 1997 reported using complementary and alternative medicine (CAM) in the form of home remedies or traditional medicine for their presenting complaint (Allen et al. 2000).

In this chapter, we examine the differences and similarities of medicinal plant knowledge in the Dominican Republic and among Dominicans in New York City. Using ethnographic and ethnobotanical fieldwork, we highlight the richness of plant species and herbal therapies used specifically for women's health, the diversity of this knowledge across rural, urban, and transnational landscapes, and the processes affecting cultural variation.

## Study Sites

Research was conducted in two provinces in the Dominican Republic and in New York City, the latter as part of an on-going project known as the Urban Ethnobotany Project, which began in 1996. Fieldwork in the Dominican Republic was conducted from September 2000 to August 2001.

### *New York City*

New York City has the second largest Hispanic population and the largest Dominican population (an estimated 424,847 people) of any US city (US Census Bureau 2000). Dominican healers involved in the Urban Ethnobotany Project resided in Washington Heights, Inwood, and the Bronx.

### *Dominican Republic*

The Dominican Republic (48,225 km<sup>2</sup>) occupies two-thirds of the island of Hispaniola, with Haiti occupying the remaining one-third. The population of the Dominican Republic is estimated to be slightly over 9 million (US Census Bureau 2005) with 70 percent of the population residing in urban centers. The ethnic origins of the Dominican population are 73 percent mulattos (defined as persons of mixed European and African ancestry), 16 percent of European descent, and 11 percent of African descent (Bolay 1997). The native language is Spanish and is blended with indigenous and African elements specific to the Dominican Republic (Cambeira 1997).

The study sites in the Dominican Republic were located in the provinces of La Vega and San Cristóbal (figure 1.1). Both a rural community and an urban community were selected in each province. La Vega is located in the central region of the country known as the Cibao, and San Cristóbal is located southwest of the capital, Santo Domingo. The study sites located in La Vega were Los Calabazos, a rural community, and the city of La Vega. Within the city, Proyecto Habitacional de San Miguel was selected as the study area. The study sites in the province of San Cristóbal were La Colonia, a rural community, and Proyecto Hacienda Fundación, a section of the city of San Cristóbal. We will refer to the urban sites as San Cristóbal and La Vega. The study sites were selected based on the following criteria: presence of a women's organization, rural and urban sites at comparable distances in both provinces, and agreement of the community to participate in the study.



*Figure 1.1. Map of the Dominican Republic showing the four study sites: Los Calabazos, La Vega city (San Miguel), La Colonia, and San Cristóbal city (Hacienda Fundación)*

## Research Methods

### *Medicinal Plants and Dominicans in New York City*

The Urban Ethnobotany Project has been working with Latino healers in New York City since 1996 to learn about their traditional healing practices for women's

health conditions (Balick et al. 2000; Reiff et al. 2003; Fugh-Berman et al. 2004). The project has focused on the following health conditions: endometriosis (growth of endometrial tissue outside of the uterus); hot flashes (sudden brief sensations of heat often experienced during menopause); menorrhagia (excessive uterine bleeding); and uterine fibroids (benign connective tissue tumors). Most recently, this study has focused on herbal therapies for uterine fibroids and hot flashes.

Data collected from Dominican healers in New York City were based on multiple patient-healer consultations, with different patients previously diagnosed by a medical physician with the aforementioned health conditions. Following the consultations, both healers and patients were interviewed. Interviews with the healers provided additional insight into healing beliefs and practices (Reiff et al. 2003) and a more thorough understanding of medicinal plant recommendations for the patients (Balick et al. 2000). Accompanied by Dominican healers, we collected plant samples, which was a valuable and necessary component of these interviews. Fresh and dried plant samples were collected at local *botánicas* in New York City to verify their scientific names and to better understand how plants are selected, which parts are used, and how the plants are prepared into medicines.

*Botánicas* are shops that sell traditional remedies and function as herbal pharmacies providing fresh and dried herbs, mixtures, and tinctures, as well as religious and ritual items such as candles, oils, figurines of saints, and holy water (*agua bendita*) (Fisch 1968; Borello and Mathias 1977; Delgado and Santiago 1998). Voucher specimens, often plant fragments from *botánicas*, were prepared of all of the plants reported during the consultations and are stored at the herbarium of the New York Botanical Garden. In addition to traditional healers, shopkeepers and assistants, who handled the medicinal plants at *botánicas*, shared herbal therapies commonly prepared with Dominican plants.

Based on these initial interviews and plant collecting trips in New York City, we became familiar with common medicinal plants used and sold by Dominicans there. In addition, we conducted a comparative literature review to gather baseline data about Dominican plants used for women's health conditions, which further provided us with a working knowledge of Dominican plants, their uses, and their common names (Ososki et al. 2002). Through our literature review we found only limited discussion and minimal details provided on women's health categories suggesting the need for further investigation in this area, which led us to conduct research in the Dominican Republic and expand the number of health conditions studied to include menstruation, pregnancy, and menopause.

### *Medicinal Plants and Dominicans in the Dominican Republic*

In the Dominican Republic, data were collected from local adult women (generalists) and healers (specialists), using a survey and an interview format. Before conducting the fieldwork, data collection instruments were reviewed and approved

by the City University of New York Graduate School Institutional Review Board (IRB # 6-10-06-01). Several measures of ethnobotanical knowledge were evaluated: the number of plant species recorded per interview, the percentage of individuals who knew a remedy for a health condition, and the number of field reports for specific medicinal plants and remedies.

The sampling methods used in the Dominican Republic were structured differently than those used in New York City. The data collected from Dominican healers in New York City were obtained via multiple consultations with different patients, while that collected with Dominican healers in the Dominican Republic involved querying healers about treatments they use for a list of health conditions and did not involve patients. Six women healers participated in the study in New York City. Eleven healers, seven women and four men, were interviewed in the Dominican Republic. Because the sample sizes and data collection methods differ, comparisons can only provide a rough estimate. However, this comparison can give a basis upon which to build further studies to address questions of transmission and acquisition of plant knowledge in different environments.

The survey elicited both qualitative and quantitative information about the diversity of herbal remedies and medicinal plant species known and used for ten women's health conditions. The initial questions generated sociodemographic data such as age, birthplace, length of residence, civil status, number of children, educational level, religious affiliation; affiliation in community organizations, and occupation. A short household inventory estimated socioeconomic background.

The bulk of the survey was about medicinal plant knowledge. Each participant was asked to free-list as many medicinal plants that they knew and used. Then each participant was asked to free-list all the plants or remedies they knew for each of the women's health conditions. As needed during the survey, symptoms were elicited and discussed to further clarify the women's health conditions selected. For those plants reported for the ten health conditions, we asked about plant part used, remedy preparation, form of administration, how it treated the health condition, if it had been used by the person interviewed, how they learned about its use, any precautions when using the remedy, and other uses. Several questions on the survey elicited names of healers, midwives, or other specialists knowledgeable about medicinal plants. Additional questions concerned plant collection and health care data. Questions for this survey were developed from previous ethnobotanical studies (Brett 1994; Alexiades 1996; Balick et al. 2000), health surveys (Aday 1989), and suggestions from our Dominican collaborators. To ensure culturally appropriate survey and interview questions and relevant women's health conditions, we depended on our fieldwork in New York City with Dominican healers and piloted the questions with our collaborators in the Dominican Republic.

Semi-structured interviews were used with healers to collect data about women's health conditions, including descriptions, symptoms, causes, and treatments. Data

was also collected about plant collection, preparation, and administration. Interviews took place in healers' homes and were usually followed by a walk to collect plants. Voucher specimens were made of medicinal plants reported during the study and are housed at the herbaria of New York (NYBG) and the Jardín Botánico de Santo Domingo (National Botanical Garden, Santo Domingo) in the Dominican Republic (JBSD). All the interviews were recorded on audiotape except for one healer who did not want to be taped. Informed consent was obtained prior to beginning the interview or survey.

### *Dominican Women's Health Conditions*

To narrow the focus of women's medicine, ten health conditions were selected (table 1.1). The conditions were selected at the initial stages of the field research prior to conducting the surveys and interviews. The term "condition" is used rather than illness because in many cases the conditions are part of a woman's life cycle and therefore are not considered illnesses. The survey focused on ten conditions, but allowed those interviewed to discuss a broad range of plant species and other home remedies. The conditions were chosen based on initial conversations with Dominican women about common health ailments (vaginal infections, menstrual cramps, postpartum care), research conducted in New York City with Dominican healers (Balick et al. 2000), and a literature review of Dominican ethnomedical studies which included infertility, suspended menstruation, and morning sickness (Ososki et al. 2002). Hot flashes, menorrhagia (excessive menstruation), and uterine fibroids were included for comparison with the study in New York City. Plants were not reported for treatment of endometriosis in the New York City study, so it was not included in the Dominican Republic study.

**Table 1.1.** Women's Health Conditions Selected in the Dominican Republic

English	Spanish
Menstrual cramps	<i>Dolores menstruales, calambres</i>
Excessive menstruation	<i>Derrame de la mujer</i>
Suspended menstruation	<i>No llega la menstruación</i>
Pregnancy prevention	<i>Prevenir el embarazo</i>
Morning sickness	<i>Mal estar de la barriga durante el embarazo</i>
Postpartum care	<i>En riesgo después de dar luz</i>
Infertility	<i>Infertilidad</i>
Menopausal hot flashes	<i>Calores del cambio, menopausia</i>
Uterine fibroids	<i>Fibromas</i>
Vaginal infections	<i>Infecciones vaginales, infecciones de la mujer</i>

Pregnancy prevention was also selected to explore preventative family planning measures in Dominican traditional medicine. From a biomedical viewpoint these conditions represent a broad range of health conditions: postpartum care and morning sickness can be classified as obstetric care, while menstruation (excessive, suspended, and cramps), infertility, vaginal infections, hot flashes, uterine fibroids, and pregnancy prevention fall under gynecological care (Venes and Thomas 2001).

## Results

To understand the cultural variation of medicinal plant knowledge in rural and urban Dominican Republic and New York City, we examined several measures of ethnomedical knowledge: the plant species and the number of field reports of these species in rural and urban communities, the percentage of rural and urban women who knew a remedy for a health condition, and the number of plant species known in New York City versus the Dominican Republic for selected health conditions. A total of 226 surveys were administered to Dominican women (Los Calabazos ( $n = 33$ ), La Colonia ( $n = 34$ ), La Vega ( $n = 87$ ), San Cristóbal ( $n = 72$ )). Healers were not included in these analyses of urban and rural communities because the number of healers per study site was significantly different (G-test,  $p < 0.0005$ ) and the mean number of distinct plant species known by healers ( $29.27 \pm SE 2.71$ ) was significantly greater than the mean for women ( $6.74 \pm SE 0.42$ ).

Of the 226 women surveyed, 200 (88 percent) named a plant or remedy for one of the ten health conditions. A total of 2,148 field reports of plants were cited by these women, including 187 plant species from 70 different plant families. Plants reported in the surveys that were not collected or verified with a photo were not included in these calculations. The total number of field reports for plant species reported by women in Los Calabazos and La Colonia was 589 and 459, respectively. The total number of field reports for La Vega was 673 and 427 for San Cristóbal. The combined value for rural communities was 1,048 and for urban communities 1,100.

### *Comparing Medicinal Knowledge across Rural and Urban Landscapes in the Dominican Republic*

#### PLANT SPECIES KNOWN IN RURAL AND URBAN COMMUNITIES

A total of 205 plant species were known by women and healers for the ten women's health conditions in the Dominican Republic. During surveys and interviews, other health conditions were discussed informally and recorded, but they are not included in this analysis. This methodology allowed us to investigate plant species that were mentioned frequently for particular health conditions and those species mentioned commonly in each community.



Several plant species were known in common between rural and urban communities, while other species were mentioned in only one community. A total of thirty-three plant species were known in common in all four communities (18 percent,  $n = 187$ ). Thirty-nine plant species (21 percent) were known only in Los Calabazos, twenty-two (12 percent) were cited only in La Colonia, nineteen (10 percent) were specific to La Vega, and fourteen (7 percent) were cited only in San Cristóbal. The plant species most frequently mentioned by women were *Marricaria recutita* L. and *Kalanchoe gastonis-bonnieri* Raym.-Hamet & H. Perrier, with 103 and 95 field reports, respectively. Table 1.2 lists all plants in the text and includes family and common names.

**Table 1.2.** Medicinal Plant Species Reported in Text

Species [Family] {Voucher}*	Vernacular Name in Spanish and English* (*between brackets)
<i>Adiantum tenerum</i> Sw. [Pteridaceae] {452}	<i>cilantrico de pozo, (fan maidenhair)</i>
<i>Agave antillarum</i> Descourt. [Agavaceae] {57, 62, 241, 378}	<i>maguey, maguey verde, maguey blanco, (agave, green agave, white agave)</i>
<i>Ambrosia artemisiifolia</i> L. [Asteraceae] {338, 371, 419}	<i>altamisa, artemisa, (ragweed)</i>
<i>Apium graveolens</i> L. [Apiaceae] {SR9}	<i>apio, (celery)</i>
<i>Averrhoa carambola</i> L. [Oxalidaceae] {SR12}	<i>carambola, (starfruit)</i>
<i>Beta vulgaris</i> L. [Chenopodiaceae] {95, PV168}	<i>remolacha, (beet)</i>
<i>Capsicum annuum</i> L. [Solanaceae] {PV164}	<i>aji, aji dulce (sweet pepper)</i>
<i>Centrosema pubescens</i> Benth. [Fabaceae] {236}	<i>diverta caminante, (butterfly pea)</i>
<i>Chamaemelum nobile</i> (L.) All. [Asteraceae] {5, 30, 32, 65}	<i>manzanilla, (chamomile)</i>
<i>Cinnamomum verum</i> J. Presl [Lauraceae] {R133}	<i>canela, (cinnamon)</i>
<i>Citrus</i> sp. [Rutaceae] {79, 99, 116}	<i>naranja, limón, (orange, lime)</i>
<i>Citrus aurantifolia</i> (Christm.) Swingle [Rutaceae] {440, 471}	<i>limón, limón agrio, (lime)</i>
<i>Citrus aurantium</i> L. [Rutaceae] {503}	<i>naranja agria, (sour orange, bitter orange)</i>
<i>Citrus sinensis</i> Osbeck [Rutaceae] {213}	<i>china, naranja, (orange)</i>
<i>Coffea arabica</i> L. [Rubiaceae] {PV160}	<i>café, (coffee)</i>
<i>Dioscorea alata</i> L. [Dioscoreaceae] {SR8}	<i>ñame, (yam)</i>
<i>Genipa americana</i> L. [Rubiaceae] {36, 464, R142}	<i>jagua</i>
<i>Glycine max</i> (L.) Merr. [Fabaceae] {SR4}	<i>soya, (soy)</i>
<i>Hamelia patens</i> Jacq. [Rubiaceae] {417}	<i>buzunuco, (scarletbush)</i>

(continued)

**Table 1.2.** Continued

<i>Helichrysum italicum</i> (Roth) G. Don f. [Asteraceae] {85}	<i>siempre fresca</i> , (curry plant)
<i>Illicium verum</i> Hook.f. [Illiciaceae] {R74}	<i>anis de estrella</i> , (star anise)
<i>Kalanchoe gastonis-bonnierei</i> Raym.-Hamet & H. Perrier [Crassulaceae] {45, 363, 376}	<i>mala madre</i> , (palm beachbells)
<i>Lavandula angustifolia</i> Mill. [Lamiaceae] {R75}	<i>algucema</i> , <i>alhubecma</i> , (lavender)
<i>Linum usitatissimum</i> L. [Linaceae] {R164}	<i>lino</i> , (flax)
<i>Matricaria recutita</i> L. [Asteraceae] {R76}	<i>manzanilla</i> , (chamomile)
<i>Momordica charantia</i> L. [Cucurbitaceae] {54, 250, 448}	<i>cundeamor</i> , <i>sorosi</i> , (bitter melon, balsam pear)
<i>Opuntia ficus-indica</i> (L.) Mill [Cactaceae] {46, 257, 274}	<i>alquitira</i> , <i>tuna</i> , <i>tuna de España</i> , (Indian fig, prickly pear)
<i>Peperomia pellucida</i> (L.) Kunth [Piperaceae] {336}	<i>siempre fresca</i> (man to man)
<i>Petiveria alliacea</i> L. [Phytolaccaceae] {89, 90, 136, 252}	<i>anamú</i> , (guinea henweed)
<i>Petroselinum crispum</i> (Mill.) Nyman ex A. W. Hill [Apiaceae] {92, PV165}	<i>perejil</i> , (parsley)
<i>Phoenix dactylifera</i> L. [Arecaceae] {113}	<i>palma</i> , (date palm)
<i>Pimenta haitiensis</i> (Urb.) Landrum [Myrtaceae] {R89}	<i>canelilla</i>
<i>Pisonia aculeata</i> L. [Nyctaginaceae] {434, 500}	<i>uña de gato</i> , (pullback)
<i>Plantago major</i> L. [Plantaginaceae] {273, 436}	<i>llantén</i> , (common plantain)
<i>Rosmarinus officinalis</i> L. [Lamiaceae] {86, 287}	<i>romero</i> , (rosemary)
<i>Roystonea hispaniolana</i> L. H. Bailey [Arecaceae] {540}	<i>palma</i> , (Hispaniolan royal palm)
<i>Ruta chalepensis</i> L. [Rutaceae] {37, 339, 407}	<i>ruda</i> , (rue)
<i>Saccharum officinarum</i> L. [Poaceae] {42, 321, 450}	<i>caña</i> , <i>melaza</i> , (sugarcane, molasses)
<i>Spermacoce assurgens</i> Ruiz & Pav. [Rubiaceae] {128, 142, 178, 390}	<i>juana la blanca</i> , (woodland false buttonweed)
<i>Tilia mandshurica</i> Rupr. & Maxim. [Tiliaceae] {34, R108}	<i>flor de tilo</i> , (linden)
<i>Uncaria tomentosa</i> (Willd. ex Roem. & Schult.) DC. [Rubiaceae] {81}	<i>uña de gato</i> , (cat's claw)
<i>Vaccinium macrocarpon</i> Aiton [Ericaceae] {100}	(cranberry)
<i>Zingiber cassumunar</i> Roxb. [Zingiberaceae] {R143}	<i>jengibre amargo</i> , (Cassumunar ginger)
<i>Zingiber zerumbet</i> (L.) Sm. [Zingiberaceae] {56}	<i>jengibre amargo</i> , (bitter ginger)

\*All numbers are A. Ososki collections

The six plant species most frequently cited by women in the rural communities were *Agave antillarum* Descourt., *Momordica charantia* L., *Spermacoce assurgens* Ruiz & Pav., *Coffea arabica* L., *Ambrosia artemisiifolia* L., and *Opuntia ficus-indica* (L.) Mill. Of these plants, *Agave antillarum*, *Momordica charantia*, and *Ambrosia artemisiifolia* were mentioned more frequently in La Colonia, while *Coffea arabica* and *Opuntia ficus-indica* were cited more frequently in Los Calabazos. A similar number of field reports of *Spermacoce assurgens* were mentioned in both rural communities. Those plants cited in rural communities are common in disturbed habitats (*Momordica charantia* and *Spermacoce assurgens*) or cultivated in *patios* (outside area surrounding a home), *conucos* (cultivated plots) or gardens (*Ambrosia artemisiifolia*, *Coffea arabica*, and *Opuntia ficus-indica*).

In the urban communities, the six species most frequently reported by women were *Matricaria recutita*, *Kalanchoe gastonis-bonnierei*, *Saccharum officinarum* L., *Beta vulgaris* L., *Cinnamomum verum* J. Presl, and *Opuntia ficus-indica*. Of these species, *Matricaria recutita*, *Saccharum officinarum*, *Beta vulgaris*, and *Cinnamomum verum* are usually purchased at supermarkets, pharmacies, or markets, while *Kalanchoe gastonis-bonnierei* and *Opuntia ficus-indica* are grown in home gardens. *Opuntia ficus-indica* is mentioned frequently in both rural and urban communities. The most frequently reported plants in rural and urban sites are different species, except for *Opuntia ficus-indica*; however, all ten plants were known in all four communities except for *Momordica charantia*, which was not reported in Los Calabazos for women's health conditions, although it was observed growing in this community.

Although some women in urban communities had front or backyard gardens, they tended to report more cultivated species found in supermarkets such as *Apium graveolens* L., *Capsicum annum* L., and *Linum usitatissimum* L. They also reported *Tradescantia spathacea* Sw., a common ornamental, and *Pimenta haitiensis* (Urb.) Landrum, an allspice endemic to Hispaniola and sold in municipal markets. This is not surprising considering an urban environment has less access to wild plant resources. Although some urban women visited relatives in the countryside to collect medicinal plants, many resorted to plants found in their urban environment or at markets. Rural women were able to collect their plants locally, except for exotic plants such as *Illicium verum* Hook.f., and *Lavandula angustifolia* Mill., which are not in cultivation in the Dominican Republic and need to be purchased at pharmacies. A flip side of this observation is that rural women have less access to plants sold in supermarkets and municipal markets because of the distance of these markets from rural communities. Common market plants such as *Capsicum annum* and *Averrhoa carambola* L. were not reported for any of the women's conditions in the rural communities. Surprisingly, these plants were not observed in rural home gardens. *Adiantum tenerum* Sw. and *Hamelia patens* Jacq. were only reported in La Colonia and were found commonly along trails or roadsides. *Hamelia patens* was observed growing in Los Calabazos, but it

was not reported for women's health. The same was true of *Centrosema pubescens* Benth., which was observed in both rural communities, but reported for women's medicine only in Los Calabazos.

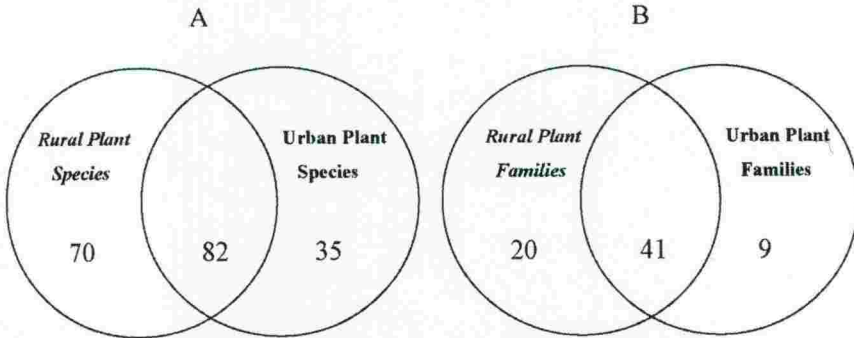
A few plants mentioned in the urban sites merit further discussion. These are ñame (yam, *Dioscorea alata* L.), soya (soy, *Glycine max* (L.) Merr.), and lino (flax, *Linum usitatissimum*). Field reports of these plants are interesting because of their popularity for women's health in the United States and other countries. Soy and flax in particular have been reputed to be sources of phytoestrogens (Adlercreutz and Mazur 1997; Setchell 1998). During the Dominican fieldwork, two women mentioned the use of flax in a plant mixture for vaginal infections. One of them also cited the same flax mixture for infertility. This is not surprising, because the majority of Dominican women interviewed mentioned that infertility is caused by an infection. Two other women mentioned soy for hot flashes; both of them had learned about this remedy from reading magazines. Of these women, one also reported yam for hot flashes. She had also learned about this remedy from a magazine article. Neither healers nor rural women reported using these plants. This illustrates a relatively unheralded way in which new knowledge about medicinal plants is acquired, suggesting the impact of global communication such as the Internet, e-mail, magazines, and television on medicinal plant knowledge. Exchange of herbal therapies is not limited to talking with a relative or neighbor but can occur through various channels and may transcend national borders. In the future, more women in these communities might report soy and flax as important plants for women's health.

A number of medicinal plant species are used in common by both rural and urban women, but each community also uses plants that were not reported in the other communities. Proximity and availability appear to be contributing factors in plant choice, as well as preferences of a person's family. As mentioned above, we observed some of the same plant species (*Centrosema pubescens* and *Hamelia patens*) growing in both rural communities, but they were only reported as medicinal plants in one of the communities. This example illustrates that a person's family or relatives may be a stronger predictor of medicinal plant preference as compared to plant availability and access.

#### NUMBER OF PLANT SPECIES KNOWN IN RURAL AND URBAN COMMUNITIES

For further comparison, the four study sites were collapsed into two categories of rural and urban. Of 187 plant species from 70 botanical families, there were 82 plant species (44 percent) that were known by both groups (figure 1.2.A). Women in rural communities cited an additional 70 plant species (37 percent) that were not known in the urban sites, while the women living in the urban communities knew an additional 35 plant species (19 percent) that were not known in the rural sites. Of the total plant species, 152 or 81 percent were known in the rural communities and 117 species or 63 percent were known in the ur-

ban communities. There is a significant difference between the total number of plant species known by rural and urban women (G-test,  $p = 0.012$ ). Figure 1.2.B shows the number of plant families that were specific to the rural and urban sites and those families that overlapped.



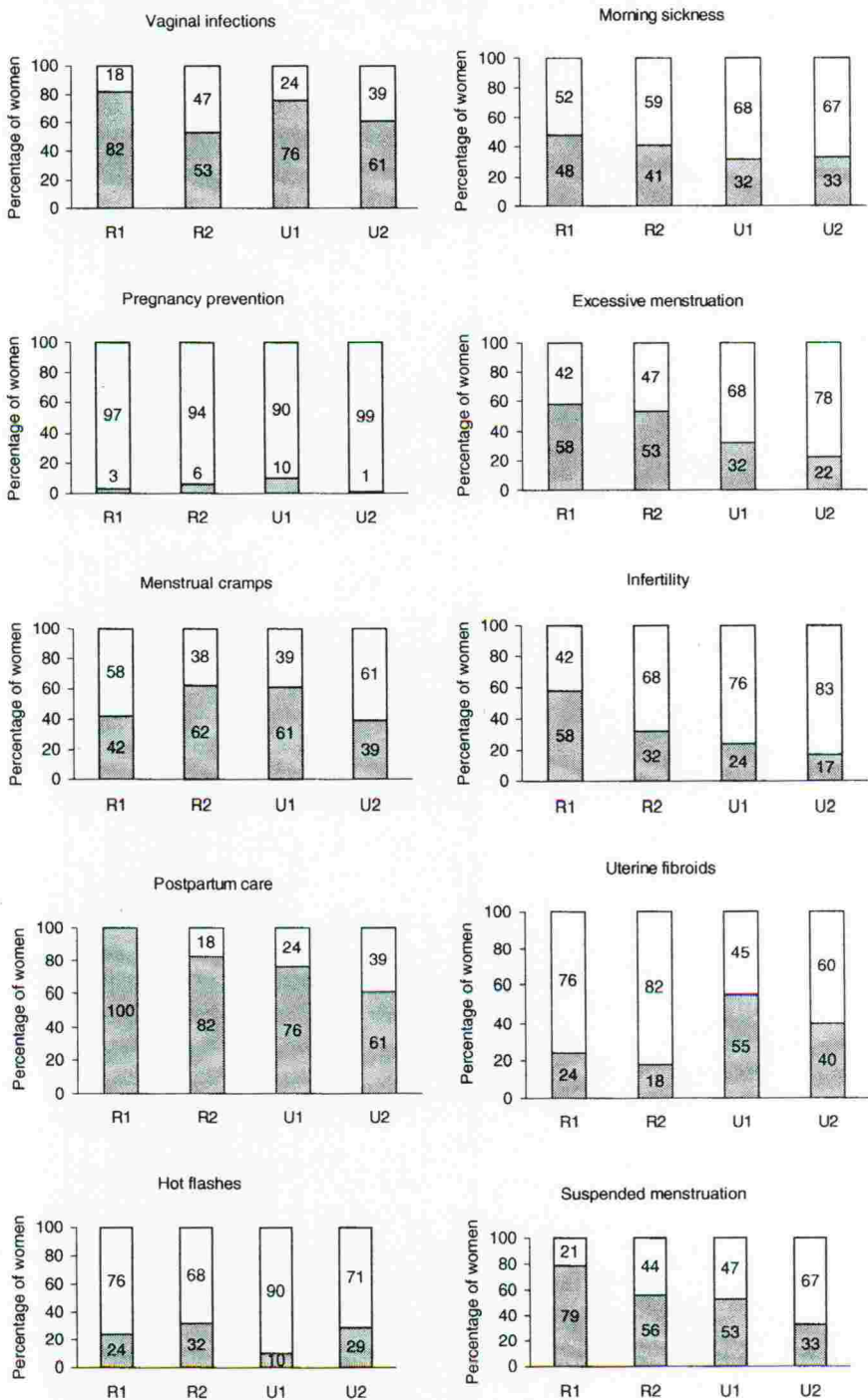
**Figure 1.2.** Venn diagrams illustrating the number of medicinal plant species (A) and botanical families (B) reported by women in rural ( $n = 67$ ) and urban study sites ( $n = 159$ ) in the Dominican Republic for ten women's health conditions

For further analysis, the mean number of plant species known per study participant was compared for rural and urban sites. The women in the rural sites reported a greater number of plant species ( $9.97 \pm SE 1.08$ ) than in the urban sites ( $5.38 \pm SE 0.34$ ). An analysis of variance test confirmed a significant difference in the means of the two groups (F-test = 27.73;  $p < 0.0001$ ). Both rural and urban women knew many of the same plant species, yet a greater number of plant species were known in rural communities than in urban communities.

#### PERCENTAGE OF RURAL AND URBAN WOMEN WHO KNEW A REMEDY FOR A HEALTH CONDITION

Figure 1.3 illustrates the percentage of women who knew a remedy for the ten women's health conditions. We used the G-test to compare the percentage of women who reported a remedy in each community for each health condition.

The greatest percentage (50 percent or more) of women in all four communities knew remedies for postpartum care and vaginal infections. These conditions appear to be salient women's health conditions. Every woman interviewed in Los Calabazos knew a remedy for postpartum care, while 82 percent of the women in La Colonia knew a remedy. A greater percentage of women in Los Calabazos knew a remedy for postpartum care than the other three communities (G-test,  $p < 0.0001$ ). San Cristóbal had the lowest percentage of women name a remedy for postpartum care (61 percent).



**Figure 1.3.** Percentage of Dominican women in Los Calabazos R1 (n = 33), La Colonia R2 (n = 34), La Vega U1 (n = 87), and San Cristóbal U2 (n = 72) who reported a remedy for the ten health conditions. Reports: shaded; No reports: white

The percentage of women who knew a remedy for vaginal infections varied. Los Calabazos (82 percent,  $n = 33$ ) and La Vega (76 percent,  $n = 87$ ), both in the same province, had a greater percentage of women report a remedy for this condition (G-test,  $p = 0.0065$ ) than the communities in the province of San Cristóbal (La Colonia = 53 percent,  $n = 34$ ; San Cristóbal = 61 percent,  $n = 72$ ). In all communities, a small percentage of women ( $\leq 10$  percent) knew a remedy for pregnancy prevention. A significantly greater percentage of women in rural communities (G-test,  $p < 0.0001$ ) mentioned a remedy for excessive menstruation than in urban communities. For this condition, both rural communities had 53 percent or more women who knew such a remedy, while the urban communities showed a maximum of 32 percent of the women.

A greater percentage of women reported traditional remedies for infertility and suspended menstruation in the two rural communities as compared with the urban communities. A significantly greater percentage of women in Los Calabazos knew a remedy for infertility (G-test,  $p < 0.0002$ ) and suspended menstruation (G-test,  $p < 0.0005$ ) than in La Colonia, La Vega, and San Cristóbal. For those same conditions, La Colonia had a significantly greater percentage of women who knew a traditional remedy than San Cristóbal (G-test,  $p = 0.01$ ), but La Colonia and La Vega were not significantly different.

Uterine fibroids was the only condition for which a greater percentage of women in urban communities reported a remedy than rural communities. At least 40 percent of the women interviewed in each urban community reported a remedy for this condition. A maximum of 24 percent of women in the rural communities reported a remedy for treating fibroids. Both La Vega and San Cristóbal, when compared with La Colonia, showed significantly different percentages (G-test,  $p < 0.0001$ ) of women who reported a remedy for uterine fibroids. Los Calabazos and La Vega also had significantly different percentages of women who knew a remedy (G-test,  $p = 0.0003$ ) for this condition; however, the percentages in Los Calabazos and San Cristóbal were not significantly different (G-test,  $p = 0.06$ ).

There are several plausible reasons for these findings. It is possible that the condition of uterine fibroids affects urban women more than rural women. They may also occur more frequently in urban women than rural women, or uterine fibroids may be considered a recently recognized women's condition which has not been incorporated into medicinal plant knowledge in the rural communities. Because uterine fibroids are usually diagnosed with an ultrasound, another explanation may be that fibroids are less likely to be detected in women who live in rural communities where there is less access to modern medical technology; therefore, the condition is diagnosed with less frequency. As a result, urban women might know more about uterine fibroids than rural women. Further studies are needed to understand these differences.

Of the women interviewed, three in the rural sites (4 percent,  $n = 67$ ) mentioned having fibroids and eleven (7 percent,  $n = 159$ ) reported having fibroids

in the urban sites. Remedies reported to treat fibroids further support the trend observed in the data above. A popular remedy for this condition was a mixture of *Beta vulgaris* and *Saccharum officinarum* (beets and molasses), which was reported by a greater percentage of women (19 percent,  $n = 159$ ) in the urban than the rural sites (7 percent,  $n = 67$ ).

Results from this data suggest that a greater percentage of rural women know medicinal plants and remedies for the ten health conditions. Uterine fibroids were an exception because a greater percentage of urban women reported traditional remedies than rural women. Pregnancy prevention showed a low percentage of women for all communities. It should also be noted that at least one woman in every community was able to report a plant or remedy for each condition.

The issue of differences in health concerns between rural and urban areas could in some cases be a function of cultural differences: one might expect rural women to be more concerned with postpartum care, for instance. Surprisingly, we expected more women to report medicinal plant treatments for pregnancy prevention. One explanation for the low percentage of women who reported a remedy for this condition may be that women did not feel it was appropriate to share this kind of information.

*Transnational Patterns in Medicinal Plant Knowledge:  
Comparing Plant Knowledge in New York City and the Dominican Republic*

In an attempt to uncover transnational patterns of Dominican ethnomedical knowledge, we compared our data from New York City (Balick et al. 2000; Reiff et al. 2003) with the data collected in the Dominican Republic. This study provides preliminary analyses about the distribution of medicinal plant knowledge across transnational landscapes and suggests the degree to which Dominican healers retain traditional knowledge in a new urban setting, distant from their homeland. Three conditions surveyed in the Dominican Republic were the same as those surveyed in New York City: hot flashes, excessive menstruation (menorrhagia), and uterine fibroids.

An ethnobotanical literature review by Ososki and co-authors (2002) provided a data set for further comparisons. This data set consists of plant species reported in thirty ethnobotanical references specific to the Dominican Republic for the above women's conditions and associated symptoms. Table 1.3 shows the number of plant species reported in each data set for a health condition and shows the number of species that were listed in all three data sets for a single health condition (overlap). *Citrus* species were reported in all three data sets for hot flashes, while *Citrus aurantifolia* (Christm.) Swingle (*limón agrío*, *lime*) was reported in the Dominican Republic, and *C. aurantium* L. and *C. sinensis* Osbeck (*naranja*, *orange*) were reported in the literature. *Naranja* and *limón agrío* were reported in New York City, but because the specimens were identified only to genus, all *Cit-*



rus species were collapsed and reported as one species that overlapped as seen in table 1.3. For hot flashes, *Genipa americana* L., *Kalanchoe gastonis-bonnieri*, and *Tilia mandshurica* Rupr. & Maxim. were mentioned by healers in New York City and the Dominican Republic but not in the literature. Two plant species, *Plantago major* L. and *Ruta chalepensis* L., were reported in all data sets for menorrhagia. *Petiveria alliacea* L. was reported by both Dominican healers and New York City healers for this condition, but it was not reported in the literature data set. Eight plant species overlapped among the three data sets for uterine fibroids and include *Beta vulgaris*, *Momordica charantia*, *Opuntia ficus-indica*, *Petiveria alliacea*, *Petroselinum crispum* (Mill.) Nyman ex A. W. Hill, *Rosmarinus officinalis* L., *Ruta chalepensis*, and *Saccharum officinarum*.

**Table 1.3.** Number of Medicinal Plant Species Reported for Hot Flashes, Menorrhagia, and Uterine Fibroids in Dominican Ethnomedical Literature ( $n = 30$ ) and by Dominican Healers in New York City ( $n = 6$ ) and the Dominican Republic ( $n = 11$ )

Health condition	Number of plant species			
	Dominican Republic Healers	New York City Healers	Dominican Literature	Overlap
Hot flashes	63	7	17	1
Menorrhagia	24	7	13	2
Uterine fibroids	56	68	57	8

Of the three conditions, uterine fibroids provides the most accurate comparison of plant use between the two study areas because of the comparable sample sizes of healers from New York City ( $n = 6$ ) and the Dominican Republic ( $n = 8$ ) that reported a medicinal plant species. A Venn diagram (figure 1.4) displays the number of plant species that overlapped for uterine fibroids among the three data sets and the number of plant species distinct to each. The total number of



**Figure 1.4.** Venn diagram illustrating the number of medicinal plant species reported in Dominican ethnobotanical literature (references,  $n = 30$ ) and by Dominican healers in the Dominican Republic ( $n = 8$ ) and New York City ( $n = 6$ ) for uterine fibroids

plant species known by Dominican healers in New York City and the Dominican Republic for uterine fibroids was 102, and an additional 29 species were reported in the literature review. Of a total of 131 species, only eight (6 percent) overlapped in all three data sets.

A total of 22 plant species (22 percent,  $n = 102$ ) were reported in common between Dominican and New York City healers for uterine fibroids. New York City healers knew a greater number of distinct plant species for fibroids ( $n = 46$ ) than Dominican healers ( $n = 34$ ), similar to the rural-urban contrast observed among women in the Dominican Republic (figure 1.3). The greater number of plants reported for fibroids in New York City than in the Dominican Republic, and the greater number of women able to report such a remedy in urban communities in the Dominican Republic than in rural communities, suggests that women tend to be more familiar with fibroids in urban environments.

Two plants that were popular treatments for uterine fibroids by New York City healers were *Agave* sp. and *Kalanchoe gastonis-bonnieri* (Balick et al. 2000). These plants were reported in the Dominican Republic for other women's health conditions, but healers did not report these plants for uterine fibroids. A plant species frequently reported for uterine fibroids among healers in the Dominican Republic that was not reported by New York City healers was *Spermacoce assurgens*. It is important to remember that these plants are often used in mixtures rather than in individual preparations.

Beet juice with molasses was a remedy reported by both New York City (Fugh-Berman et al. 2004) and Dominican healers for uterine fibroids. A *botella* was another remedy reported for uterine fibroids in New York City and the Dominican Republic, although it was not always referred to by this name in the New York City study, rather only the plants and preparation were reported. A *botella* often refers to a complex mixture of plants that is prepared as a decoction and usually stored in a bottle and administered orally at room temperature or cold if refrigeration is available. Caramelized sugar, honey, *malta* (malted barley beverage), and alcohol (rum, gin, or wine) may be added as additional ingredients. The preparation of a *botella* varies depending on the healer, the illness being treated, and ingredient availability. It should be noted that Dominicans may also use the term *botella* to refer to a tincture in which plant fragments such as leaves, chopped branches, or roots are placed in a bottle and then alcohol is added; but, this preparation is often referred to as *mama juana*, which was not reported for the ten women's conditions. *Botella* preparations specifically used to cleanse the uterus and to remove any impurities after pregnancy may also be called a *bebedizo*. Perhaps the use of a *botella* for postpartum care has been adapted for fibroids as a way of cleansing and removing fibroids from the uterus. Differences in treatment approaches may be explained by individual preferences; perhaps each healer uses his/her own remedy for a health condition.

Table 1.4 lists 13 plant species reported in New York City for uterine fibroids (Balick et al. 2000) that were not reported in the Dominican Republic for any women's health condition. Several of the plants listed in table 1.4 do not even grow in the Dominican Republic, such as *Uncaria tomentosa* (Willd. ex Roem. & Schult.) DC. and *Vaccinium macrocarpon* Aiton.

**Table 1.4.** Medicinal Plant Species Reported Exclusively by Dominican Healers in New York City ( $n = 6$ )

Species [Family] [Voucher]*	Vernacular Name in Spanish and English* (*between brackets)
<i>Chamaemelum nobile</i> (L.) All. [Asteraceae] {5, 30, 32, 65}	manzanilla, (chamomile)
<i>Coccothrinax argentea</i> (Lodd. ex Schult. & Schult.f.) Sarg. ex Becc. [Arecaceae] {106}	cana, (silver thatch palm)
<i>Fevillea cordifolia</i> L. [Cucurbitaceae] {72, 75}	ayamo, jayamo, (jallamo, antidote cocoon)
<i>Ficus religiosa</i> L. [Moraceae] {78}	alamo, (sacred fig, peepul)
<i>Helichrysum italicum</i> (Roth) G. Don f. [Asteraceae] {85}	siempre fresca, (curry plant)
<i>Myrsine</i> sp. [Myrsinaceae] {104}	palo santo, (colicwood)
<i>Phoenix dactylifera</i> L. [Arecaceae] {113}	palma, (date palm)
<i>Solanum tuberosum</i> L. [Solanaceae] {118}	papa, (potato)
<i>Tabebuia impetiginosa</i> (Mart. ex DC.) Standl. [Bignoniaceae] {35}	palo de arco, (pau d'arco)
cf. <i>Taraxacum officinale</i> Weber [Asteraceae] {61}	diente de león, (dandelion)
<i>Uncaria tomentosa</i> (Willd. ex Roem. & Schult.) DC. [Rubiaceae] {81}	uña de gato, (cat's claw)
<i>Vaccinium macrocarpon</i> Aiton [Ericaceae] {100}	(cranberry)
<i>Zingiber zerumbet</i> (L.) Sm. [Zingiberaceae] {56}	jengibre amargo, (bitter ginger)

\*All numbers are A. Ososki collections

Of these thirteen *taxa* reported exclusively in New York City for uterine fibroids, five have the same common name as plants reported in the Dominican Republic (table 1.5). Three of the plants exclusive to New York City but sharing common names with Dominican Republic medicinal plants are also in the same botanical families. In the Dominican Republic, the chamomile used was *Marricaria recutita*, while in New York City Dominican healers used *Chamaemelum nobile* (L.) All., both Asteraceae. In the Dominican Republic *siempre fresca* was identified as *Peperomia pellucida* (L.) Kunth in the Piperaceae family, while *siem-*

*pre fresca* in New York City was *Helichrysum italicum* (Roth) G. Don f. in the Asteraceae family. The *palmas* of New York City and of the Dominican Republic are both palms, *Phoenix dactylifera* L. and *Roystonea hispaniolana* L. H. Bailey, respectively. In contrast, the *uña de gato* used in New York City was *Uncaria tomentosa*, which is usually imported from Peru and is a different plant family than *Pisonia aculeata* L. used in the Dominican Republic. The two plants known as *jengibre amargo*, *Zingiber cassumunar* Roxb. in the Dominican Republic and *Zingiber zerumbet* (L.) Sm. in New York City, are in the genus *Zingiber*. Table 1.5 illustrates the importance of collecting voucher specimens for ethnobotanical studies because common names can be the same but the plant species are different.

**Table 1.5.** Plant Species Used by Dominican Healers in New York City and the Dominican Republic That Share the Same Vernacular Name

New York Plant Species Species [Family] [Voucher]*	Dominican Plant Species Species [Family] [Voucher]*	Vernacular Name in Spanish and English* (*between brackets)
<i>Chamaemelum nobile</i> (L.) All. [Asteraceae] {5, 30, 32, 65}	<i>Matricaria recutita</i> L. [Asteraceae] {R76}	<i>manzanilla</i> , ( <i>chamomile</i> )
<i>Helichrysum italicum</i> (Roth) G. Don f. [Asteraceae] {85}	<i>Peperomia pellucida</i> (L.) Kunth [Piperaceae] {336}	<i>siempre fresca</i> , ( <i>curry plant, man to man</i> )
<i>Phoenix dactylifera</i> L. [Arecaceae] {113}	<i>Roystonea hispaniolana</i> L. H. Bailey [Arecaceae] {540}	<i>palma</i> , ( <i>date palm</i> , <i>Hispaniolan royal palm</i> )
<i>Uncaria tomentosa</i> (Willd. ex Roem. & Schult.) DC. [Rubiaceae] {81}	<i>Pisonia aculeata</i> L. [Nyctaginaceae] {434, 500}	<i>uña de gato</i> , ( <i>cat's claw</i> , <i>pullback</i> )
<i>Zingiber zerumbet</i> (L.) Sm. [Zingiberaceae] {56}	<i>Zingiber cassumunar</i> Roxb. [Zingiberaceae] {R143}	<i>jengibre amargo</i> , ( <i>bitter ginger, cassumunar ginger</i> )

\*All numbers are A. Ososki collections

The results in tables 1.4 and 1.5 signify that people seeking medicinal plants in new settings find substitutes for commonly used species to which access is no longer possible. Homonyms may be applied in cases where the substitute is related to the original, or resembles the original (e.g., the thorns of *Uncaria tomentosa* and of *Pisonia aculeata*), or is perceived as serving the same purposes. The United States government strictly regulates plant species allowed into the country; therefore, some species that are commonly used in the Dominican Republic may not qualify for importation, such as fresh fruits which may be used medicinally but also may carry pathogens that could harm agriculture in the United States. As a result, New York City healers may be forced to rely on other species. Different species that are substituted may be selected because of their efficacy or

use for similar conditions in other pharmacopoeias in New York City. In some cases, plants with similar physical characteristics and morphology may be substituted. For example, the flowers of *Chamaemelum nobile* and *Matricaria recutita* or the rhizomes of *Zingiber zerumbet* and *Zingiber cassumunar* are similar in appearance. Other plants may be selected because they share a common name even though their morphology is quite different such as *siempre fresca*, which refers to *Peperomia pellucida*, a succulent plant, and can also refer to a non-succulent, *Helichrysum italicum*. Further studies are needed to better understand how plant species are substituted in new settings.

## Discussion

Several patterns were observed from our findings. Rural women showed a tendency to know more medicinal plants for women's health conditions than urban women except for uterine fibroids. More urban women and healers in the Dominican Republic and New York City knew medicinal plants for uterine fibroids than their rural counterparts. Some plants were known specifically in one community while a number of plants were known in all five study sites. Understanding these rural, urban, and transnational similarities and differences can help further untangle the complexities of medicinal plant knowledge.

### *Cultural Similarities and Differences*

Rural and urban communities shared species and knowledge but there were also plants unique to the pharmacopoeia of each community. Both rural and urban women were able to report home remedies and plants for all ten health conditions. While the communities shared many plant species in common, it was demonstrated that some plants were preferred over others in each community.

In some cases, a plant species was found growing in more than one community but was only reported in one site. This is illustrated by a couple of plant walks during which the first author would occasionally point out a plant that was reported in another study site to see if they had a use for it in the currently visited site. For these few cases the women responded that the plant was considered a "weed" and not used. In future studies, it would be interesting to combine the lists of reported plants from several communities and use the checklist or plant interview technique as described by Boom (1987) to query individuals.

In the Dominican Republic, rural women reported more plant species than women living in urban communities. These results suggest an erosion of plant knowledge as people migrate to urban centers. These results, perhaps in part, are due to the limited access and exposure in urban environments to natural resources including plants and increased preference for other forms of treatment such as pharmaceuticals. Other studies (Milliken and Albert 1996; Alexiades 1999: 353)

have reported a similar pattern of increased use of pharmaceuticals and a decreased use of plant medicine among indigenous groups as they become acculturated.

The Dominican Republic is culturally diverse due to historical events and migrations of various cultural groups. It should be noted that in addition to plant species distribution across the Dominican Republic, cultural differences regionally may also help to explain varying plant use in the provinces of La Vega and San Cristóbal. The percentages of women who reported a remedy for vaginal infections and hot flashes in figure 1.3 show that regional differences between the provinces, in addition to urban and rural dichotomies, may further suggest patterns to explain cultural variation of Dominican medicinal plant knowledge. San Cristóbal is considered to have stronger African origins than La Vega and the Cibao region (Cambeira 1997, B. Peguero pers. comm.). In addition, San Cristóbal is more urbanized as it is closer to the capital than La Vega, which is composed of more *campesinos* (peasants). Future longitudinal studies in these same communities could compare plant knowledge over time to see how their pharmacopoeias evolve and to better understand the acquisition of cultural plant knowledge. For example, it would be interesting to see if flax and soy become more widely reported by women in these communities as these herbs increase in popularity in urban centers, or if more rural women become familiar with remedies for uterine fibroids.

### *Plants for Women's Medicine*

The variety of plants used for the ten women's health conditions is extensive and includes cultivated, wild-collected, and purchased plants. Individuals in urban environments tended to purchase their plants or grow them in home gardens. A few species, such as *Plantago major* and *Spermacoce assurgens*, are wild-collected because they are readily available in empty lots, along roadsides, and in disturbed habitats. Rural women tend to rely on plants that they have access to in their home gardens and *conucos* or on plants that can be wild-collected. Rural women reported few plants that needed to be purchased.

Many plants are known in all five study sites, but we did note some plants that were specific to a community. For example, *Adiantum tenerum* was specific to La Colonia. *Adiantum tenerum* was reported by nine different women in La Colonia and was used primarily for postpartum care. It was also reported for suspended menstruation, infertility, and vaginal infections. Medicinal plants used for uterine fibroids in New York City and in the Dominican Republic also showed similarity and variation. Species were reported in New York City that were not reported in the Dominican Republic, and other species were mentioned in the Dominican Republic that were not cited in New York City. Transnational comparisons of Dominican traditional medicine provide an additional perspective on the evolution of healing practices as people migrate to new environments,

and they offer a lens to see how plant knowledge is exchanged through a multitude of networks.

### *Traditional Knowledge of Women's Health Conditions*

The higher percentage of rural women who reported a remedy for the ten selected conditions may be because there is a greater reliance on natural resources in rural settings as compared to urban environments. Distance from health centers, costs of transportation, and high costs of medications may also contribute to the reliance on traditional medicine, manifested as an increased level of medicinal plant knowledge in rural areas. Women in urban communities may rely on allopathic medicine perhaps because it is more readily available and accessible to them than medicinal plants. Education and social pressures may also encourage urban women to use biomedical resources more than medicinal plants. However, this may change with the spreading popularity of herbal use in the United States and other countries. In the future, perhaps Dominican women living in urban areas will report more herbal medicines, incorporating those from their families as well as new uses acquired from the media or neighbors from other regions or even, perhaps, from abroad.

## **Conclusion**

Plant knowledge for Dominican women's medicine both differs and coincides across Dominican rural, urban, and transnational landscapes. The groups are not exclusive, and much of the ethnomedical knowledge overlaps. Some plant species and healing knowledge may be group-specific because of cultural preferences, access to plant resources, and influences of media and technology, while other species and healing knowledge are shared between groups.

The rural communities tended to hold an overall greater knowledge base about women's traditional medicine than the urban communities. This holds true for the number of plant species known and the percentage of women who reported a remedy for different health conditions. In conclusion, the greater knowledge demonstrated in rural environments probably stems from close contact with natural resources and reliance on these resources for health care. People in urban communities, in contrast, have access to a diverse array of treatment approaches and less contact with natural resources and diverse plant populations. Yet this increased access to biomedicine by individuals in urban settings such as La Vega, San Cristóbal, and New York City has not caused them to lose their knowledge about traditional medicine; instead, the two are used in parallel.

Ethnobotanical studies are needed that address cultural variation and change. In addition, studies are needed to further elucidate the transmission of plant knowledge and to highlight factors that affect the acquisition of plant knowledge. How

is ethnomedical knowledge appropriated, transferred, and exchanged in different settings? What mechanisms affect the loss and gain of this knowledge? Further examination of pharmacopoeias that are specific to rural, urban, and transnational communities may provide insight on factors that affect the transmission of cultural knowledge. A deeper grasp of the distribution of plant knowledge in communities may provide useful insight to help explore these questions.

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