From the Rainforest to the Medicine Cabinet

The making and re-making of traditional medicine in Ecuador

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Abstract

The rapid evolution of global conceptions and treatments for healing practices has challenged the status of those that are heavily situated in history. In the biodiversity rich landscape of Ecuador, traditional medicine is framed as a static and outdated practice primarily due to the global rise of allopathic medicine. Bioprospecting holds the potential to transform traditional medicine into a dynamic practice again, however, its allopathic foundation has led to a frictional negotiation. As a result, allopathic practices have supplanted older practices and have become the dominant health service in Ecuador. The implications of this single focused system are primarily experienced by indigenous populations, due to their historical ties with traditional medicine. In an effort to explore if bioprospecting aids in the legitimization of traditional medicine, I applied cluster analysis. I selected six primary actors that included the economic value of biodiversity preservation, the National Cancer Institute, the Convention on Biological Diversity (CBD), Ecuador's Intellectual Property Rights (IEPI) organization, an Ecuadorian pharmaceutical company, and patent revision for equal benefits in bioprospecting. I selected primary sources when possible and otherwise extreme case examples. I then analyzed how each source defined four reoccurring concepts; biodiversity, (traditional) medicine, traditional knowledge and indigenous peoples. I was able to deduce if the sources supported or marginalized traditional medicine within the context of bioprospecting. Negotiating the rights for traditional medicine within the economic framework of bioprospecting, has given indigenous peoples more power and voice. It, however, has done little to legitimize traditional medicine in its original context, thus perpetuating a gap in health care services and failing to draw in underserved indigenous populations in Ecuador.

Stepping into the Ring: the fight for valuation in the modern world

The branching-off pattern of value systems has been an ongoing source of conflict, stemming from the confrontation of differing values. It stretches the timeline of human history from colonialism to globalization, which has allowed it to recently take the fast-track due to increased methods of mobilization. Through globalization, humans have effectively conducted trade of material goods, ideas, and even values through personal, commercial, and international negotiation. Immigration serves as a common medium in which differing values are entertained in the same setting. Within this cross-cultural exchange of values, a subset of differing values arises. Health presents a dramatic range of values that generates great tension among stakeholders. Values regarding the conception and treatment of health have continuously evolved through the process of globalization. The outcomes are partly defined by the economic power of the nation in which the healing system is being practiced. If lacking economic potential in the modern context, healing systems have been victims in the stampede to maximize profits. In addition to the price tag of a given health care practice, its value is also defined by its position on the human timeline. Globalization has been responsible for spreading the most modern items, ideas and values. As a result of this pattern, older values are often perceived as outdated and irrelevant. In order to prevent the usurping of one set of health values over another, a negotiation between the two systems must take place.

Bioprospecting, which can involve extracting genetic resources to synthesize into pharmaceutical drugs, has presented a medium in which differing value systems have the potential for this negotiation to take place. As a tool for the research and development of pharmaceutical drugs, it is geared towards allopathic values of health. This framework poses a challenge for health care practices that already exist in the extraction location because they can quickly become overshadowed. One popular site for bioprospecting is the biodiversity rich rainforests of Ecuador. I have chosen to situate my research in Ecuador because it is

classified as one of the world's top biodiversity hotspots, containing up to 46 vegetation types and more than 17,000 vascular plant species.[1] I acknowledge that bioprospecting does not solely take place in tropical rainforests, but I have chosen to situate my research in such a setting because the constellation of actors that it involves effectively exemplifies the gaps, challenges and potentials within this process. Ecuador also serves as a prominent case study in examining bioprospecting because it is home to over 17 different cultural groups, including indigenous peoples.[2] This distinct combination of actors is amplified because bioprospectors can use indigenous information in locating medicinal plants.

One challenge that has deemed bioprospecting a controversial act is that it often fails to recognize and compensate all actors involved in the extraction process. Indigenous healing methods, also known as traditional medicine, have been used as a research tool to identify medicinal plants for bioprospecting. Since indigenous peoples have occupied the ecosystems of Ecuador well before colonization, they have developed extensive knowledge about medicinal plants in the tropical rainforest. This field of knowledge, also known as traditional knowledge (TK) particularly pertains to knowledge generated by indigenous peoples, given their cultural and geographic context. However, providing this knowledge to bioprospectors has resulted in an exploitative relationship because indigenous peoples have received no legal entitlement or economic compensation for their contribution.

Countless other cases have exemplified this situation, as seen with the patenting of ayahuasca in 1986 by scientist, Lauren Miller.[3] Ayahuasca, a vine plant native to the Amazonian rainforest, has been used by healers to treat sickness and spiritual balance for centuries. Miller traveled to the Ecuadorian Amazon, where he collected an ayahuasca specimen and upon returning to the U.S., filed a patent. In years following, several indigenous groups protested this patent as an exploitation

[1] Lucia de la Torre, Carlos Cerón, Henrik Balsley, and Finn Borchsenius. 2012. "A Biodiversity Informatics Approach to Ethnobotany: Meta-analysis of Plant Use Patterns in Ecuador." Ecology and Society.
[2] Ibid.

of their traditional knowledge. Antonio Jacanimijoy, the council representative for over 400 indigenous groups in South America, exclaimed that "[o]ur ancestors learned the knowledge of this medicine and we are the owners of this knowledge."[4] The tense interaction between indigenous entities in defending their traditional knowledge and scientists protected by patenting agencies has been exacerbated by the fact that "the United States does not recognize prior foreign use of an 'invention' as a bar to obtaining a patent…"[5] Given this overlook, the fight for equal compensation and legal recognition of traditional knowledge has continued to be perpetuated.

The disconnect between the legal agency and indigenous groups has continued to widen in the context of traditional knowledge and medicine in Ecuador. Beyond the realm of patent titles in not recognizing traditional knowledge, Ecuador's health care infrastructure has reinforced this pattern. Indigenous peoples' perception of health, traditional medicine, differs greatly from the nation's primary model of allopathic practice. From this divergence in perceptions comes a challenge to meet the health needs of the entire population. The demand for an integrated system comes from the disproportionate demographic of indigenous peoples living in poverty and adverse health conditions. The situation is intensified because 25% of the population is categorized as indigenous and this demographic has been recognized to be the most economically marginalized population nationwide.[6]

The fight for representing traditional medicine in the current health infrastructure has proven difficult considering its history. It was banned by the Spaniards in an effort to terminate previous societal structures and remained in effect until 1992. Traditional medicine has come to be regarded as a static healing practice of the past. Such classification was supported by the Ecuadorian government, as exemplified in their current position in endorsing allopathic medicine as the primary form of health care. The continuation of bioprospecting, as

[4] Fecteau, Leanne M. 2001. "Ayahuasca Patent Revocation: Raising Questions About Current U.S. Patent Policy, The." Boston College Third World Law Journal 21: 71.
[5] Ibid, 71.
[6] "The World Factbook: Ecuador." Central Intelligence Agency.

a tool for furthering the development of allopathic resources, has aided in pushing traditional medicine to the backdrop of modern healing practices.

In response to this marginalization and exploitation, an uprising of efforts have focused on constructing legal forms to protect this genre of traditional knowledge. International conventions, patent revisions, and property right organizations have either included TK protection as their primary or supporting objective. Through this increase in global discourse, traditional knowledge has become a topic of discussion, especially in terms of its contribution for increasing indigenous rights. Negotiating the rights for traditional medicine within the economic framework of bioprospecting, has given indigenous peoples more power and voice. It, however, has done little to legitimize traditional medicine in its original context, thus perpetuating a gap in health care services and failing to draw in underserved indigenous populations in Ecuador.

In this thesis, I will question the current allopathic construction of health in Ecuador in its ability to meet the health needs of the entire population. I will begin by providing a profile of the current health conditions in Ecuador and their disproportionate affect on indigenous populations. I then explain the principles governing traditional medicine and offer a contrast with allopathic medicine. I specifically explore this divergence of values in the context of bioprospecting, including responsive efforts for increasing traditional knowledge protection through patenting and property rights. By the end, I hope to illuminate the historical patterns that have arisen from health value interactions within bioprospecting as a means to suggest the challenges and opportunities for future forms of integration.

I address this progression of events and evolution of values by conducting cluster analysis. From mapping out the key players involved in bioprospecting, I selected six primary actors. These include the Convention on Biological Diversity (CBD), the Ecuadorian Intellectual Property Rights (IEPI) organization, an Ecuadorian pharmaceutical company, a U.S. pharmaceutical research firm, the sharing of benefits in bioprospecting and the economic value of drug development as a form of biodiversity preservation. I then chose primary sources, when possible, and otherwise selected extreme examples for the given actor. From there, I

identified several key concepts that were prominently used across most texts, including *biodiversity, (traditional) medicine, indigenous peoples and traditional knowledge*. I then constructed a chart to better visualize the distribution of how each term was used by observing the gaps and patterns across texts. After analyzing the representations of these concepts, I was able to deduce their implications in relation to traditional medicine in the context of Ecuador. I then compared these results between sources and found that they were not necessarily legitimizing traditional medicine in its original form, but rather giving it an economic value. The valuation was contingent upon translating traditional medicine into a more allopathically supported form by refining its representation beyond the local context.

Constructing the Set: actors involved in the landscape of health

Diagnosis of Health in Ecuador

To set the stage for the relative importance of my paper, I now provide a profile of the health care services in Ecuador. To begin, monetary resources are severely limited with 27.3% of the population under the poverty line.[7] The economic insecurity is reflected in health services, with the mortality rates as high as 5.4 per 1,000 people in 2002.[8] The government has tried to address the shortage in available health care services by centralizing the health care system. "The government has increased its social spending to ameliorate these problems, but critics question the efficiency and implementation of its national development plan."[9] Financial instability still acts as a major barrier, however, especially for indigenous populations who make up 25% of the population.[10] "Ecuador's high poverty and income inequality most affect indigenous, mixed race, and rural populations."[11] Given the disproportionate lack of health services along with the divergence of indigenous health values from allopathic medicine, it is crucial to form an integrated system.

President Rafael Correa, elected in 2006, promised to address these class disparities by restructuring the social hierarchy. In 2007, he proposed the formation of a citizen assembly to rewrite the constitution, which passed with 82% approval from the public.[12] Though not a frontline issue for him, health services were introduced under the new constitution. In 2008, the constitution was re-written to include that "health is a right guaranteed by the state." It went on to explain that this included "timely and non-exclusive access to programs, actions and services promoting and providing integral healthcare…governed by the principles of

[7] C.I.A., *The World Factbook: Ecuador*.
[8] Encyclopedia of the Nations, "Ecuador Health." Accessed May 6, 2013.
[9] C.I.A., *The World Factbook: Ecuador*.
[10] Ibid.
[11] Ibid.
[12] Conaghan, Catherine M. 2008. "Ecuador: Correa's Plebiscitary Presidency." Journal of Democracy 19 (2): 46–60.

interculturalism…"[13] Such stipulations suggested the need to restructure health care in Ecuador to include other forms of practice. Correa sought to address this through the creation of executive decree 181 on December 21, 2009. It held the objectives to manufacture drugs within the borders of Ecuador as a means to increase self-sufficient operations of health within national borders. Enfarma, a national pharmaceutical company, was created to provide expedient and wide-reaching services.

Though Enfarma and other implemented health care efforts expanded the number of citizens receiving medical care, it perpetuated the gap in addressing the constitutional goal of "providing integral healthcare… governed by the principles of interculturalism."[14] The statement assumed that the allopathic method of healing is a universal model to effectively address the health needs of the entire nation. The danger of this assumption arises in the face of Ecuador's multi-cultural demographic, which is composed of several different constructions of health. One of which is traditional medicine, which was developed by the indigenous populations. Currently traditional medicine is not represented as a primary health care option, meaning the basic health care values and needs of indigenous peoples fail to be met.

Roots to the Tree of Health: a historical synopsis of traditional medicine

The term traditional medicine, as it is recognized internationally, refers to the healing practices implored by a given indigenous group, based upon the available biological resources. The parameters for being indigenous, as given by the UN Economic and Social Council, are "peoples and nations… which, having a historical continuity with pre-invasion and pre-colonial societies that have developed on their territories, consider themselves distinct from other sectors of the societies now prevailing…"[15] Working with this understanding, indigenous peoples developed knowledge in their specific cultural and geographic context.

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[13] Lucia de la Torre, et al. *A Biodiversity Informatics Approach to Ethnobotany*.
[14] Conaghan, *Ecuador: Correa's Plebiscitary Presidency, 46-60.*
[15] Posey DA. 2002. "Commodification of the Sacred Through Intellectual Property Rights." Journal of Ethnopharmacology 83 (1-2): p3.

According to the World Health Organization. "traditional medicine is the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures that are used to maintain health, as well as to prevent, diagnose, improve or treat physical and mental illnesses."[16] I do not intend to paint a romanticized image in portraying their stereotype of having an innate connection with the earth. Instead, I am interested in focusing upon the knowledge, values and practices that they generate within this context and explore its contemporary position.

Because the available resources shape traditional medicine practices for a given community, they form distinct healing techniques and *medicine cabinets*. Each system has its own set of values and beliefs that guide the practice. In this way, healing systems can be understood as extensions of an indigenous population's cultural values. Situating my research in the Ecuadorian rainforest allows me to examine the unique interplay between this biologically diverse region of the world and the indigenous peoples who occupied this area for centuries.

The value system that governs traditional medicine in Ecuador rests on three dimensions; the mind, body and spirit. To be healthy, one must have all three be at a point of equilibrium.[17] When unbalanced, a person becomes ill, at which point they must seek the guidance of a curandero, or healer, to help them identify what is off balance and how to regain ailment. The curandero's task is to address a patient's entire *being*. They direct their attention towards the physical and supernatural worlds to identify what dimensions are out of balance. This treatment ranges in methodology from place to place, but primarily involves a combination of both ritual and plant remedies. Plants are believed to hold power to help people re-gain balance. Identified medicinal plants are often then imbued with certain energies by the healer, acting as a sort of vessel. "A curing ceremony normally involves purification of the patient by orally spraying blessed and enchanted herbal

[16] "WHO Traditional Medicine." 2013. *WHO*. Accessed May 6.
[17] Chelala, C. 2009. "Health in the Andes: The modern role of traditional medicine." The Globalist.

extracts."[18] The central role of plants in this healing process has led to the exploration for and experimentation of hundreds of plants over a span of centuries.

The practice of and knowledge created by traditional medicine in Ecuador, however, has undergone severe criticism throughout its history. As new healing frameworks, such as allopathic medicine, were introduced through globalized mechanisms of trade and commerce, traditional medicine became categorized as an ancestral and outdated practice. This appeal toward modernity was supported by the ban created by the Spaniards. It prosecuted those who were caught practicing traditional medicine, effectively generating legal fear and shame surrounding the practice. The ban was lifted in 1992 when the constitution was rewritten to more accurately reflect the multi-cultural demographic of the nation, specifically in reference to indigenous cultures. "Centuries of prohibition have led to a pronounced abandonment of traditional knowledge."[19] The loss further perpetuated the static portrayal of traditional medicine in the landscape of health care.

Symptomatic Analysis: how allopathic medicine isolates and operates

Having explained why traditional medicine is central to addressing Ecuadorian health care needs, I now illustrate its divergence from allopathic values of health. Allopathic medicine refers to medical practices that focus on treating symptoms. It took off in the 1800s when scientists figured out how to isolate the chemical compounds in plant drugs, which marked the beginning of pharmaceutical drugs as a form of medical treatment. For example, scientists discovered that "the clinical effects of drugs such as opium… could be attributed to the chemical compound morphine."[20] From this connection, pharmacologists could identify that these compounds and their relative medicinal properties were based on isolated alkaloids. The method of identifying a single property within a plant became a standardized technique within allopathic medicine. For example, the Madagascar

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[18] Bussmann, Rainer, and Douglas Sharon. 2006. "Traditional Medicinal Plant Use in Loja Province, Southern Ecuador." *Journal of Ethnobiology and Ethnomedicine*.
[19] Ibid.
[20] Phillipson, J.David, and Linda A. Anderson. 1989. "Ethnopharmacology and western medicine." *Journal of Ethnopharmacology Journal of Ethnopharmacology* 25 (1): 62.

Perwinkle was used for hundreds of years by indigenous peoples before it was identified and tested by the National Cancer Institute. Now it is one of the primary ingredients in chemotherapy treatment worldwide.[21] "With Western [allopathic] medicine, we like to use technology to isolate the smallest possible particle that may be diseased all the way down to the electrical charge of a molecule."[22] This technological focus allows for the detection of small fluctuations in the body.

Biologically diverse regions, such as the Ecuadorian tropical rainforest, provide great opportunity in the exploration of new drug ingredients. "Ecuador possesses 26 distinguished habitat types, each with characteristic flora related to altitude and precipitation. Among these are three of the world's 10 biodiversity 'hot spots.'"[23] Ecuador has historically been identified as a prime zone for exploring potential drug compounds, especially considering that up to 25% of industrially produced medicines are based on natural compounds.[24] Keeping this proportion in mind, pharmaceutical companies have heavily focused their research in this region.

In Search of Fertile Land: the beginnings of biopropsecting

After illustrating the dependent relationship between allopathic medicine and drug development, I now delve into the research process that bridges the two. Bioprospecting, developed in the late twentieth century, refers to the method for locating and extracting resources from a given ecosystem. The primary regions of extraction are biodiversity rich marine and terrestrial areas, such as tropical rainforests. Ecuador has been an extraction site since the 18th Century through ethnobotanical research.[25] The collected genetic materials, such as plant matter, are then developed into marketable products primarily for agrichemical and

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[21] Noble, Robert L. 1990. "The Discovery of the Vinca Alkaloidschemotherapeutic Agents Against Cancer." Biochem. Cell Biol. Biochemistry and Cell Biology 68 (12): 1344–1351.
[22] Gancoa.net: Chinese medicine for a restless world. (2009, November 30).
[23] *Convention on Biological Diversity: Text and Annexes*. 1994. Châtelaine, Switzerland: Interim Secretariat for the Convention on Biological Diversity.
[24] Mulligan, Shane, and Peter Stoett. 2000. "A Global Bioprospecting Regime: Partnership or Piracy?" *International Journal* 55 (2): 224.
[25] Lucia de la Torre, et al. *A Biodiversity Informatics Approach to Ethnobotan*y.

pharmaceutical development.[26] "The…image might startle those who view biodiversity as an environmental cause rather than as a medical tool or industrial commodity. However, medicines have always been found in nature, which remains a promising repository of new compounds for pharmaceutical research and development."[27] Pharmaceutical companies have identified this repository, but the catch remains how to narrow down field research processes. "Many of our medicinal plants which have continued to be used clinically are now given in the form of isolated compounds."[28]

Collaborating with healers or locals who are knowledgeable about medicinal plants has played a role in contributing to this research. The collaboration may not come in the form of direct communication with a local, but rather drawing from pre-existing evidence of medicinal plants, whose properties were identified by indigenous peoples. For example, hunters in the Amazon have used a plant poison to coat their arrows and darts to paralyze their prey. Through clinical testing in the 1930s, this poison was found to block neuromuscular receptors in the human body. It proved to be an extremely valuable medication as a muscle relaxant during surgery.[29] Discoveries such as this often offer great advances for the drug company, but little benefit for those who provide and or develop this knowledge. "Bioprospecting is a new name for an old practice: it refers to corporate drug development based on medicinal plants, traditional knowledge, and microbes culled from 'biodiversity-rich' regions of the globe."[30]

Given the areas of exploitation, its critics have renamed bioprospecting to *biopiracy.* Environmental advocate, Vandana Shiva, took this stance in her book *Biopiracy: the plunder of nature and knowledge,* in which she discussed patenting

[26] Merson, John. 2000. "Bio-Prospecting or Bio-Piracy: Intellectual Property Rights and Biodiversity in a Colonial and Postcolonial Context." Osiris 15 (January 1): 282–296. doi:10.2307/301953.
[27] Mulligan, et al. *A Global Bioprospecting Regime*, 224.
[28] Phillipson, *Ethnopharmacology and Western Medicine*, 62
[29] Ibid, 62.
[30] Hayden, Cori. 2003. When nature goes public : the making and unmaking of bioprospecting in Mexico / Cori Hayden. Princeton: Princeton University Press, 1.

and its contribution to the privatization of knowledge.[31] Author Nuno Pires de Carvalho also debated the challenges of protecting knowledge without legal infrastructure for enforcement. For example "a shaman shows a bioprospector a plant that he uses on patients who complain of headaches. The bioprospector does not need further instructions to understand that the plant contains a potentially useful active ingredient."[32] The role of the shaman or curandero, therefore, can quickly become undermined and removed after the given plant is identified. The treatment process and spiritual significance quickly becomes irrelevant, as they do not have a place in the clinical trials of drug development.

Due to the difference in healing systems between allopathic and traditional medicine of Ecuador, an expansive gap in communication has immerged. To the bioprospector, the plant's value resides in the active compounds that have yet to be isolated. Once isolated, the ingredients is then synthesized into drug form and tested in clinical trials to ensure its level of effectiveness. It offers a great contrast to the Ecuadorian healers, who may view the whole plant as an agent for healing, often in compliment to spiritual rituals. I am neither suggesting that the allopathic is superior nor inferior to the traditional approach. Both hold value in different realms of healing and have been successful in addressing the health needs of the given population. I am merely trying to illustrate the significant contrast between the two outlooks on the value of a given plant, and therefore hope to suggest the dangerous gap that may arise from such an exchange.

Having explained the issue of unequal compensation and the loss in translation, I now set the stage for understanding how it relates to the health care system in Ecuador by further elaborating on the constitutional gaps. As mentioned earlier, the 2008 revisions to the constitution stated that intercultural forms of health are considered basic human rights. Ecuador's current health care model is based upon allopathic principles, as illustrated in the establishment of the Enfarma drug industry. Yet the constitution's claim to meet multi-cultural health needs failed

[31] Shiva, Vandana. 1997. Biopiracy : the Plunder of Nature and Knowledge. Boston, MA: South End Press.
[32] McManis, Charles R. 2007. Biodiversity and the law : intellectual property, biotechnology and traditional knowledge. London; Sterling, VA: Earthscan, 244.

to be fulfilled because, as discussed above, allopathic medicine is not the sole model of healing in the country. Assuming so would be undermining the entire historical contribution of indigenous peoples. It is also important to consider that the indigenous population, having historically experienced significant levels of oppression and marginalization, is one of the primary demographics in need of health care services.

As a means to address this gap, the Ecuadorian government must acknowledge the need for intercultural forms of healing to provide supportive medical services. Methods of integration have occurred on a small scale in the form of hybrid clinics, where both allopathic and traditional medical services are offered. One clinic, Jambi Huasi, is located in the northern region of Otavalo, Ecuador. It offers both allopathic and traditional or indigenous health care services. It stated that "traditional medicine can help modern doctors gain acceptance in wary communities and expand treatment options."[33] The advantage of collaborating between allopathic and traditional medicine models of health would not only allow for a more domestically independent health care system, but would also aid in treating a more comprehensive portion of the population.

Put a Patent on It: an investigation of traditional medicine and knowledge

The contrasting value systems held between bioprospectors and locals who provide the plant knowledge is coupled with a lack of legal infrastructure involved in bioprospecting. There is no system of accountability for the bioprospector to provide compensation in this exchange, as patenting does not demand such specification. Applying for a patent protects the inventor's rights to the product and any sales generated, yet the criteria for whom this includes is extremely limited. The jurisdiction of the inventor, however, has significantly expanded after the U.S. Supreme Court Case of Diamond vs. Chakrabarty in 1980. The case was based upon a patent field by scientist, Ananda Mohan Chakrabarty, for a bacterium that was developed to break down crude oil. The debate was centered on the issue of

[33] Chelala, *Health in the Andes*.

whether the bacterium could be patented because it was a live organism. The court ruled in favor of Chakrabarty because the bacterium was drastically altered from its original state. The court defined the criteria for patenting to be "anything under the sun that is made by man."[34] The results of this ruling were far reaching as inventor rights not only included scientifically engineered products, but also modified live organisms, including plants.[35] The Chakrabarty ruling represented a new challenge for those fighting for equal compensation in the drug development process. Those who developed the synthetic product were not only granted the inventor title, but also inherited full entitlement to its use and generated proceeds.

Through the Looking Glass: traditional knowledge as a lens for medicine

As bioprospecting became a more politicized and controversial act, traditional medicine was categorized under the title of *traditional knowledge*. From this change, came a paradigm shift away from the comprehensive practice of traditional medicine towards a more easily quantified and recorded aspects of *knowledge.* Integral to this shift was the increased demand for equally sharing of funds for indigenous peoples in order to protect their practices from further exploitation. They had to focus on the patentable dimensions, which revolved around their knowledge about local flora and fauna and their relevant medicinal properties. Anthropologist Cori Hayden introduced the idea as "knowledge… [that] contain[s], reproduce[s], or represent[s] people's interests."[36] Nuno Pires de Carvalho added to this by outlining the parameters specifically for traditional knowledge to "…consist of knowledge itself, that is, ideas developed by traditional communities and indigenous peoples… as a response to the needs imposed by their physical and cultural environments."[37] For clarification, the author defined traditional to be a "… means that TK is developed according to the rules, protocols and customs of a certain community, and not that it is old."[38] In an effort to protect

[34] U.S. Supreme Court. *Diamond V. Chakrabarty*.
[35] Merson, *Bio-Prospecting or Bio-Piracy*, 282–296.
[36] Hayden, *When Nature Goes Public*, 19.
[37] McManis, *Biodiversity and the Law*, 243.
[38] Ibid, 244.

traditional medicine, the focus was directed towards patentable dimensions of traditional knowledge, which limited its representation.

Departure from Charted Territory

The majority of the academic works on this subject focus on the need to implement a more rigorous and enforceable system to ensure that those who hold the cultural title of traditional knowledge are assigned a more active role in bioprospecting. Pires de Carvalho, for example, argued the need to develop policies to allow indigenous peoples to participate more fully in this process by reforming the patenting procedure. He suggested that a requirement be inserted into the patent form, which would include the geographic locations and permission from actors involved in a product's development. The requirement clause would provide more legal and economic recognition for indigenous peoples. Because there are no direct benefits to the pharmaceutical company for this change, it lacks the power to challenge the current structure. Haydn, took a similar approach, but specifically focused on the social changes that result from bioprospecting by examining the political challenges that arise from converting traditional medicine and knowledge into a pharmaceutical product.[39] Similar to both authors, other anthropologists and academic writers place high criticism in the physical shortcomings of the bioprospecting and the patenting process.

I argue along a similar vein as Haydn, but expand the lens of transformation beyond its connection to pharmaceutical drugs. Instead, I argue that this provides a unique and promising platform for traditional medicine to gain new value and place in the current practice of medicine in Ecuador. By considering TK a property right, it serves as a catalyst for introducing traditional medicine as a plausible healing practice beyond the borders of the romanticized "Shaman's hut."

[39] Hayden, *Bioprospecting's Representational Dilemma*, 185–200.

Surgical Procedure for Analysis

I used cluster analysis to address the different value systems represented in the bioprospecting discourse as it relates to traditional knowledge and medicine. Cluster analysis uses key concepts from given resources to construct the author's worldview. These key concepts often develop certain cluster configurations with periphery terms that form a pattern about the author's attitudes in the given subject. Key concepts are selected either based upon their repeated use or intensity, meaning they are positioned at the center of the argument. I used a concept map to display all of the actors and how they relate to one another. From here, I was able to identify the primary actors and dimensions for selecting my sources.[40]

I gleaned various types of sources ranging from organization websites, to convention texts to anthropological articles. I concluded that there were six central aspects within this field of focus. They included the economic motive for biodiversity preservation through pharmaceutical drug development, patent reformation for equal sharing of benefits, the Convention on Biological Diversity (CBD), Ecuador's Intellectual Property Rights firm, an international drug research firm, and an Ecuadorian pharmaceutical company.

Though some of these are organizations and others are entire fields, I tried to apply a consistent methodology in treating them all as players in this process. This entailed selecting sources from each sector to then conduct cluster analysis. These are not intended to serve as representative samples, but rather were selected based upon their unique configuration around my research question. The configuration arose because the sources were either primary, when possible, or served as an extreme example in its field. The patterns in this discourse were clearly illuminated by the contrasts and overlaps between actors, allowing me to easily extrapolate the greater arguments in relation to my thesis of legitimizing traditional medicine in the negotiation of different health values.

[40] Foss, Sonja K. 2004. *Rhetorical Criticism: Exploration & Practice*. Long Grove, Ill.: Waveland Press.

After selecting these six sources, I read each one to identify key concepts that were consistent across the majority of texts. These were chosen based on their intensity as they were central to the authors' argument. These terms included *biodiversity, (traditional) medicine, traditional knowledge & indigenous peoples.* After selecting the terms, I conducted an in-depth cluster analysis on one source in reference to a single concept to solidify my methodology and exemplify the cluster-like behavior of my selected concepts.

I then constructed a table that recorded representative quotes from each source in relation to the given term. I organized the quotes into three categories, which included economic, biological or social. These categories were chosen because they represented the three major fields of focus across all sources. The table allowed me to easily quantify the general trends of how each term was presented and then deduce its overall attitudes in the context of bioprospecting and the protection of traditional knowledge. It also illuminated gaps in the discourse based upon unequal representation across the categories. For example, if the concept *biodiversity* was never refereed to in relation to its social value, this may indicate an important gap in the current discourse.

The Patient: a look at the resources for analysis

Concept Map of Key Actors

The idea behind a concept map is to display all of the variables involved in a given issue or field of focus. I have created a concept map for bioprospecting by mapping all of the different actors and their relationships with one another. I did this by positioning bioprospecting in the middle and then listing all of the other actors, processes and policies stemming from bioprospecting based on my background research. I then tried to string all of these terms together, which helped me visualize the relationship between the given actors. The process also helped illustrate which actors and terms were most prevalent to bioprospecting and my research focus.

Through the complex web of players and relationships generated by bioprospecting, the concept map ensured an extensive exploration of the subject. I began by examining the economic benefits generated from this form of drug research and development. The act does not satisfy everyone involved in the process, thus introducing several other actors to the scene. For example, indigenous peoples providing the traditional knowledge seek economic compensation for the contribution. They have worked alongside several entities such Ecuador's Intellectual Property Rights (IEPI) and the Convention on Biological Diversity (CBD) to reassert current indigenous rights. The primary gap in rights, however, resides between the Ecuadorian constitution and current health service infrastructure implemented by the government. Though this map is not comprehensive in scope, it illustrates the central actors and their connection with one another. This process allowed me to identify and select my six key actors and four concepts for conducting my analysis.

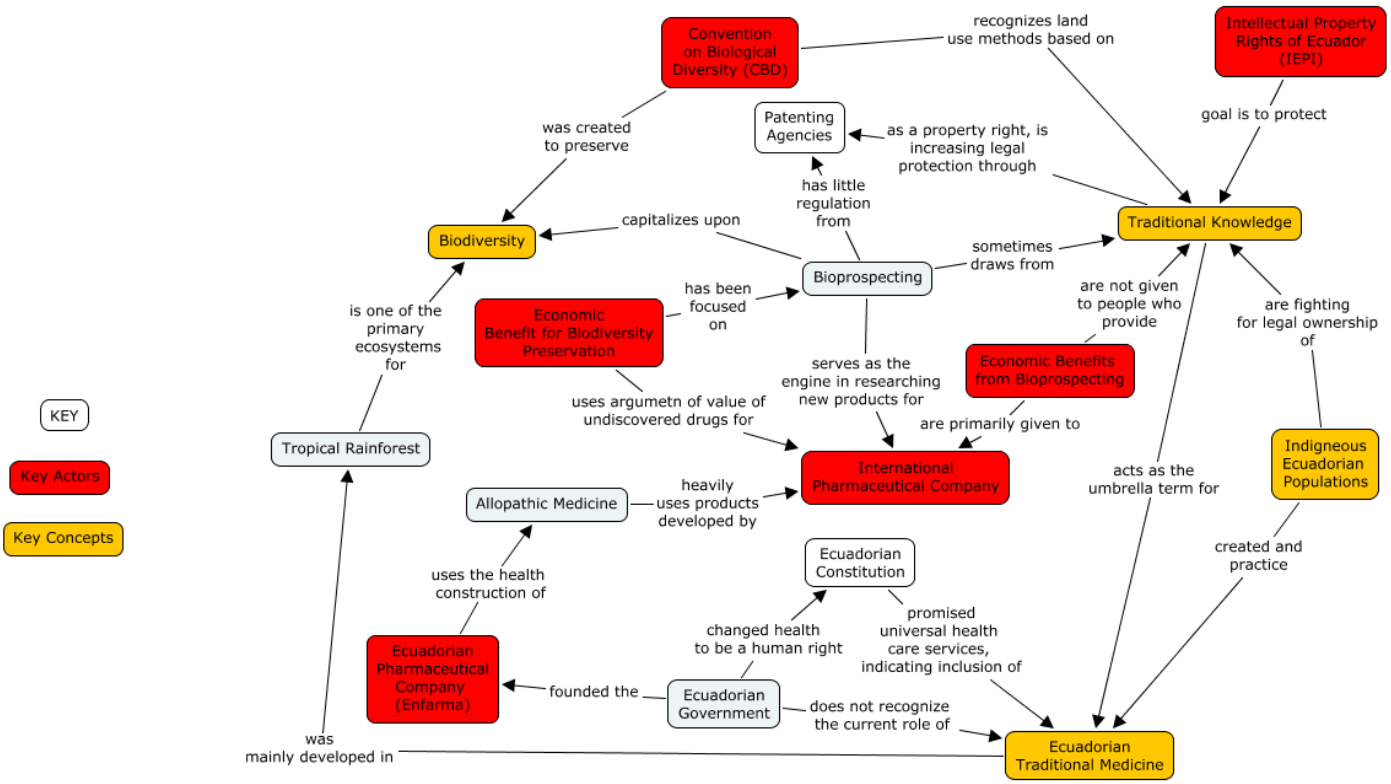

Figure 1: Illustration of my concept map centered around the process of bioprospecting.

Background of Sources

Economic motives for Biodiversity Preservation:

1.) *Valuing the Rain Forest: The Economic Value of Nontimber Forest Products in Ecuador* by Michael Balick and Robert Mendelsohn[41] presents the monetary motives for pharmaceutical companies in pursuing biodiversity preservation. I selected this article because it was one of the most comprehensive sources I found that discussed the economic value of biodiversity, while also investigating the costs and benefits of pharmaceutical drug development.

[41] Mendelsohn, Robert, and Michael J Balick. 1997. "Valuing Undiscovered Pharmaceuticals in Tropical Forests." Economic Botany 51 (3): 328.

Patent Reformation for Equitable Sharing of Benefits:

2.) *From the Shaman's Hut to the Patent Office* by Nuno Pires de Carvalho[42] provided several methods for the expansion of patenting power to ensure equitable sharing of benefits with traditional knowledge holders. To create more ample protection for and ownership of this knowledge, Pires de Carvalho presented the situation to be a matter of developing policies to allow indigenous peoples to participate more fully in this process. He both provided a taxonomic and patent reformation solution. This source did not specifically refer to the issue of patenting in Ecuador, but rather gave a global approach. The expansiveness of this scope allowed me to apply my findings beyond Ecuadorian borders, which proved to be crucial given that the issues are internationally relevant.

Convention on Biological Diversity (CBD):

3.) *Convention on Biological Diversity : text and annexes*[43] is the official text from the CBD, which outlined the goals and agreements of the member nations. It was created in June, 1992 and Ecuador signed the agreement in February, 1993. They emphasized the need to protect biodiversity for human use both for economic and social reasons in current and future periods. They presented a technological approach to allow for more "sustainable" extraction practices, often implementing techniques based on traditional knowledge. I selected this source because it is the original text developed by the CBD and includes all of its concept definitions and international agreements.

[42] McManis, *Biodiversity and the law*.
[43] *Convention on Biological Diversity*.

Instituto Ecuatoriano de la Propiedad Intelectual (Ecuadorian Intellectual Property Rights-IEPI):

4.) IEPI was founded with the objective of protecting distinct products or services in the economic market. Ecuadorian citizens can register their ideas and/or products, including traditional knowledge, with IEPI to ensure its protection. In February 2011, they created an educational cartoon to explain the importance of using IEPI to address traditional knowledge in relation to biodiversity preservation. It was titled *Ancestral Knowledge, Cultural Expression and Biodiversity.*[44] The narrator, a frog endemic to Southern Ecuador, met with various indigenous peoples to explain the importance of biodiversity protection nationwide. The cartoon encapsulated the attitudes held by IEPI towards traditional knowledge and biodiversity preservation because its child-friendly format aimed at creating a cohesive and representative message.

International Drug Research Firm:

5.) The *National Cancer Institute* is one of the largest research firms in the world devoted to the research and development of cancer treatment. They hire scientists or bioprospectors to conduct field research, collecting samples to then run screens for potentially active compounds to treat cancer patients. Authors James Miller and Armand Randrianasolo conducted a case study on NCI in Madagascar in *Sampling a Diverse Flora for Novel Biochemicals: An Analysis of NCI Collections from Madagascar.*[45] NCI identified the Madagascar periwinkle to be highly effective for chemotherapy treatment. I chose this source because it presented a critique of

[44] El Epibatidin, (Cuenca, Ecuador: Instituto Ecuatoriano de la Propiedad Intelectual, 2011), illustration, http://issuu.com/iepie/docs/elepibatidin-022011, 4.
[45] Miller, James S, and Armand Randrianasolo. 2005. "Sampling a Diverse Flora for Novel Biochemicals: An Analysis of NCI Collections from Madagascar." Economic Botany 59 (3): 221–230.

NCI's research process, particularly on a case study that mentions traditional knowledge as a potential research tool.

Ecuadorian Pharmaceutical Company:

6.) *Enfarma* is a national pharmaceutical company founded in response to the 2008 constitutional change that prioritized "health [as] a right guaranteed by the state."[46] Ecuadorian President Rafael Correa responded to this with the creation of executive decree 181 on December 21, 2009.[47] It held the objectives to manufacture drugs within the borders of Ecuador as an effort to expand access to medicine for Ecuadorian citizens. I used their website as well as a news report. I argue that using their website is preferable to scholarly articles because it acts as a primary source.

Sample Passage to Exemplify Methods

To illustrate my methodology for cluster analysis, I have included a longer a passage from one of my sources. From this excerpt, I aim to demonstrate the cluster-like behavior of the terms in a given source and how these speak to the author or given stakeholder's attitudes. The source I selected is the economic motive for biodiversity preservation.

> in order to slow the rapid destruction of tropical forests and the concurrent loss of *biodiversity*, it is critical to identify and quantify the benefits of conserving the remaining standing forests. Although the standing forest provides many market and nonmarket services, including materials for *traditional medicine*, the existence of undiscovered pharmaceuticals for modern *medicine* has often been cited as one of the most important reasons to protect tropical

[46] Lucio, Ruth, Nilhda Villacrés, and Rodrigo Henríquez. 2011. "The Health System of Ecuador." Salud Pública De México 53 (January): s177–s187. doi:10.1590/S0036-36342011000800013.
[47] Anon. 2011. "ENFARMA." enfarma. http://www.enfarma.gob.ec/.

> forests and plants in general…We explore the value of plants from the perspective of a private drug company and society as a whole[48]

In an attempt to interpret this excerpt, I begin by drawing out a few key terms. Obviously this source is promoting biodiversity preservation through the advancement of pharmaceutical drugs. However, we can deduce more by looking at how the authors present this argument. First off, they pose the situation to be linear and time sensitive by opening with the direct threat of habitat destruction. This trajectory then sets the stage for their argument, which is that modern medicine is the leading reason for protecting these forests. Modern medicine or allopathic is thus positioned as a contemporary practice whose fate depends upon further exploration. Traditional medicine, however, is presented as a valuable non-market motive for preservation, which conveys its inferior value in relation to allopathic given the objective of generating profit. Although this piece could be pulled apart further, the above analysis begins to illustrate the train of thought and method of deduction that I applied to all sources. How concepts are positioned within a piece provide concrete evidence of the authors' objectives and attitudes towards the subject. From cluster analysis, I was able to construct these previously invisible perspectives outside of the boundaries of the text.

Table 1: Representative Quotes from Sources

In applying cluster analysis to the six identified players, I hoped to identify differing uses of the same terms, repeated conceptions and gaps in individual discourse around my research topic. I used three broad categories; economy, biology and social, in which I hoped to identify how the concepts were represented across the sources. This allowed for divergences and convergences in conception to more easily be identified as they were put into a quantifiable format. Given these patterns, I am able to deduce the constructions of each term from the sources to

[48] Balick, et al. *Valuing Undiscovered Pharmaceuticals*, 223.

then evaluate if they help legitimize traditional medicine as a modern healing practice.

Biodiversity		
Stance	Stakeholder	Quote
Economic	Mendelsohn and Balick	"The potential value of undiscovered drugs is an additional incentive to conserve species-rich forests throughout the world" (227).
		"Market products and services provide additional quantifiable reasons to preserve standing forests" (227).
	CBD	"The Earth's biological resources are vital to humanity's economic and social development" (1).
	IEPI	"[Biodiversity is important] because with our biodiversity, we can obtain medicine, food, perfume, dies and many other useful products for our daily lives" (4).
Biological	CBD	"Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species" (8).
	NCI	"In order to obtain representative sample of biological diversity, collecting must be carefully guided by taxonomy" (228).
Social	CBD	"Affirming that the conservation of biological diversity is a common concern of humankind" (2).
		"Recognizing the close and traditional dependence of many indigenous and local communities… on biological resources" (2).
		"…growing recognition that biological diversity is a global asset of tremendous value to present and future generations" (1).
	IEPI	"All Ecuadorians can benefit from our biodiversity" (5).
(Traditional) Medicine		
Stance	Stakeholders	
Economic	Enfarma	"...focusing its action for excellence in the production of drugs to break into the international market"
	Mendelsohn and Balick	"The aggregate potential social value for undiscovered tropical forest pharmaceuticals is about $147 billion" (225).
	NCI	"Plants have been a valuable source of pharmaceutically useful compounds…[and] have yielded many drugs and chemical structures that are included as active ingredients in more than 25% of U.S. pharmaceuticals" (221).
Biological	NCI	"All modern programs for the discovery of novel natural products depend on a supply of biological materials for screening" (221).
Social	Enfarma	"to define policies and actions in the field of the provision

		and supply of drugs in the country, considering their health needs and respecting the principles of equity, identity and culture."
	IEPI	"For example, from this type of leaf, we can get a pill to cure our sicknesses" (4).
		"For example, in my community we have used for many years different types of plants as medicine" (3).
	Enfarma	"Create an Ecuadorian Pharmaceutical Industry leader in the production of essential drugs for public institutions."

Traditional Knowledge & Indigenous Peoples		
Stances	Stakeholders	
Economic	IEPI	"If we do not protect these [TK], they will be lost to others who will gain economic advantage" (8).
	Pires de Carvalho	"Because the market has yet to express its recognition of TK, any legal measures should be simple enough so as not to create costly barriers and encumbrances to the effective transformation of TK into marketable goods and services" (268).
		"Another important aspect is that shamans who supply relevant, if not crucial, genetic material may provide important support for the activities of research and development of pharmaceutical and biotechnologcal companies" (251).
	NCI	"…ethnobotanical selection of species has not resulted in statistically significant improvement of discovery rates in high throughput screens" (222).
Biological	IEPI	"TK Unit's mission, to promote the development, protection and dissemination of genetic resources, biological resources."
	Pires de Carvalho	"[TK] as a response to the needs imposed by their physical and cultural environment" (243).
	CBD	"Protect and encourage customary use of biological resources in accordance with traditional cultural practices" (10).
Social	IEPI	"We have transferred [TK] on for generations and generations in oral form, like always… we should pass it onto future generations" (3).
	Pires de Carvalho	"TK consists of knowledge itself, that is, ideas developed by traditional communities and indigenous peoples" (243).
	NCI	Ethnobotanical methods of plant selection refers to the process of selecting "...species with history of indigenous use" (222).
		"All samples of National Cancer Institute program are collected with full prior consent of the source countries, and the plant material is collected and exported only after an agreement has been signed with an appropriate governmental authority" (222).

Analysis of Biodiversity

Biodiversity is primarily defined through an economic framework based upon its value in providing raw materials. It can be saved when positioned alongside drug development. The source authored by Balick and Mendelsohn employs this outlook as they outline the monetary value that biodiversity yields in developing pharmaceutical drugs. They conclude that a new drug is worth $96 million to a company and up to $450 million to society. These staggering figures illustrate the economic value of *biodiversity* preservation, specifically in genetically rich regions such as tropical rainforests.

As seen in table 1 in the biodiversity section, these economic focused arguments were the dominant stance across the sources. It was closely tied with the recognized social value of biodiversity preservation. Instituto Ecuatoriano de la Propiedad Intelectual (IEPI) and the Convention on Biological Diversity (CBD) continually referred to the social and economic value of developing sustainable methods of management. The CBD specifically focused on applying traditional knowledge to address rapid biodiversity loss. They emphasized the need to incorporate locally developed techniques and ensure "equitable sharing of benefits arising from the utilization of such knowledge, innovations and practices."[49] It is vital to protect biodiversity on a global scale because of its value in "humanity's economic and social development."[50]

These social and economic foci were strengthened by IEPI, which stated that the value of *biodiversity* resides in the potential products that can be developed from these resources. "Because from our biodiversity, we can obtain medicine, perfumes… and many other products that are useful for our daily lives."[51] They

[49] *Convention of Biological Diversity*, 9.
[50] Ibid, 1.
[51] Instituto Ecuatoriano de la Propiedad Intelectual, *El Epibatidin*, 4.

outline such production to take place within Ecuadorian boundaries, advocating for small-scale and multi-cultural operations.

Both the National Cancer Institute (NCI) and Enfarma failed to mention the preservation of *biodiversity* in their sources. NCI, however, referred to biodiversity when discussing efforts to collect representative samples of species for testing and development. They emphasized that "…the goal of most of these programs is to gather a set of species that are representative of the botanical diversity that exists in a given region."[52] Biodiversity was not presented as an issue of preservation but rather as a challenge to collect enough samples. One possible reason for the absence of preservation both for NCI and Enfarma is a difference in scale. International economic examinations of biodiversity preservation use a long-term, evaluative outlook, while both pharmaceutical companies focus on the current and goals of their firm. Other gaps in the representation of biodiversity arose in the area of its biological value. The intrinsic or even aesthetic arguments for biodiversity were absent in all discourses. Instead, biodiversity was positioned as a resource to draw from to aid in social and economic advancements. Reasons for this likely stem from the global economic structure that govern international exchange and discourse.

Analysis of (Traditional) Medicine

Traditional Medicine is either positioned on a linear scale of health, as it is perceived as a practice of the past or in reference to its cultural significance. The IEPI discusses *TM* in relation to biodiversity protection and its role as a form of cultural identification. A cartoon representation of an indigenous Shuar woman from the Amazon explained, "…from this type of leaf, we can make a pill to cure our illnesses."[53] Interestingly, this paints the picture that *TM* is intrinsically linked to allopathic medicine. She treated the leaf as a raw material that needed to be synthesized into a pill for it to be considered complete and effective medicine. This depiction could either be explained by the historical influence allopathic medicine has had on traditional medicine practices, as it has effectively transformed the way

[52] Miller, et al. *Sampling a Diverse Flora,* 222.

[53] Instituto Ecuatoriano de la Propiedad Intelectual, *El Epibatidin*, 4.

in which medicine is perceived. Or it could be interpreted as an intentional way to articulate the need to translate *TM* into a modernized context to increase its value. Through this portrayal, the "*traditional*" component was effectively removed from the current healing context. This brings into question the idea of being "undiscovered," a term used in Balick and Mendelsohn's source. The plant is not yet discovered or recognized as medicine through an allopathic framework, classifying it as incomplete.

Figure 2. In trying to better understand cultural practices represented by traditional knowledge, the Indigenous Shuar woman shared "Oh for example, from this type of leaf, we can make a pill to cure our illnesses." The frog narrator then exclaimed, "Exactly, Nunkui! What an intelligent child."[54]

Though *traditional medicine* was not legitimized as an independent healing practice, its economic value was recognized in relation to TK in providing a refined direction for research and development, as seen in the economic section of table 1. This was further demonstrated with Enfarma's use of the term as they employed a

[54] Ibid, 4.

social framework for the importance of *medicine*. This attitude was demonstrated by the company advocating for pharmaceutical drugs as the universal treatment method in addressing the health care needs of Ecuador.

Enfarma's omission of the traditional dimension to medicine forms an inconsistency with the constitutional goals. It stated that its aim was to expand health access in Ecuador, yet citizens who do not believe in and use allopathic medicine would effectively be excluded from this service. Other gaps in the discourse are found in the lack of discussion regarding the biological dimension of traditional medicine. It can be understood that this includes the medicinal plants and their ecosystems. The ecological value of these variables thus is not recognized. Due to this gap, the authors were operating under the assumption that the biological variables were either not under direct threat and thus of little concern or did not have intrinsic value of their own. The second is more likely considering that all discourses presented biota as having secondary importance given that it was a resource to aid development. Such conclusions are not surprising considering the backgrounds of each actor operating in the current economically driven world. However, this gap is indicative of the priorities of the actors and is thus valuable when evaluating the situation.

Analysis of Traditional Knowledge & Indigenous Peoples

Traditional medicine's primary opportunity for being considered in the context of bioprospecting is to resurface on the back of *traditional knowledge.* The primary argument for how this can occur is if TK is adequately protected and enforced through patenting. Pires de Carvalho argued from this vantage point. First, he defined *TK* as knowledge that was generated by the distinct cultural and geographic context of a given population. The terms "traditional" and *TK* were only classified in relation to *indigenous people*, meaning colonial populations were not granted this title. But for this very reason, *TK* has come to be treated as a static and isolated concept absent from the current patenting discourse. In fact, according to Pires de Carvalho *indigenous peoples* can receive more recognition of their *TK* through redefining and enforcing the criteria of the *inventor* in the context of

patenting. The inventor must be identified in order to deal with issues of authorization in the legal realm of use, economic rights, etc… "The correct identification of the patent owner is therefore essential for ensuring legal security and… is one of the most crucial aspects of patent law."[55] By suggesting a re-evaluation of this term, the author implied that *TK* can be owned and defended on the premise of property rights.

Pires de Carvalho applied the argument of property rights to be a way to increase the economic value of TK if the social orchestration of entitlements was clarrified. He was primarily referring to this in relation to indigenous peoples receiving a portion of the benefits generated from product sales. Developing a more comprehensive patenting model would not only allow indigenous peoples to gain a seat in current bioprospecting activities, but also potentially introduce dimensions of TK such as traditional medicine to the contemporary frame.

IEPI implement a similar conception of *TK,* as its efforts are also centered on converting *TK* into a property right to increase its degree of protection. It defines *TK* within the context of Ecuadorian *indigenous populations,* through visual depictions of historically significant populations, such as Shuar people from the Amazon and Afro-Ecuadorians from Esmeraldes. These identified populations were conveyed through the use of stereotyped appearances, such as face paint and culturally unique attire, which immediately communicated a specific region or time in history to the audience. Once the criteria and regions for *indigenous peoples* were identified, the cartoon explained that TK serves as a form of cultural identification for *indigenous peoples* and therefore deserves ample protection.

CBD primarily supported the economic platform for *TK's* significance. They strived to "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity."[56] Essentially, they identified TK as a tool in addressing biodiversity loss. One gap in the document, however, was the lack of clarification in defining *indigenous peoples.*

[55] McManis, *Biodiversity and Law,* 253.
[56] *Convention on Biological Diversity*, 9.

They worked under the stereotype that *indigenous peoples* reside in rural regions and work harmoniously with the earth. Working with a static conception of *indigenous peoples* raised the question of whether CBD's goals were realistic and applicable. Even with this romanticized and outdated depiction, by including *indigenous peoples* in the text, CBD introduced the need for collaboration with indigenous peoples in developing effective strategies for biodiversity preservation.

In the selected source, the National Cancer Institute paid little attention to the role of traditional knowledge. It emerged on the list of methods for identifying and gathering materials under the term *ethnobotanical*. This was defined as species, which were selected based upon indigenous use. The authors, however, claimed, "while ethnobotanical selection of species has not resulted in statistically significant improvement of discovery rates... it may be very well suited to certain focused discovery efforts."[57] This claim indicates NCI's attitudes towards the use of TK in identifying plants for sample testing. Such perspective likely developed both from the lengthy process of employing TK as a research tool and its divergence from their understanding of health. Traditional medicine is likely not recognized as a current legitimate practice under their standards, making TK resources irrelevant.

Gaps in the TK discourses were primarily situated around the social motives of preservation. IEPI advocated developing legal protection for TK, but in a taxonomic manner, where it was frozen in time. IEPI argued that this would allow indigenous populations to ensure this knowledge to be passed down to future generations. This framed TK to have amuseum value, rather than current one. Although CBD counters this by providing a contemporary value for indigenous peoples and their knowledge, its significance does not stray outside of the realm of land use.

[57] Miller, et al. *Sampling a Diverse Flora*, 222.

Implications in Legitimizing Traditional Medicine

The perpetuated use of biodiversity, (traditional) medicine, traditional knowledge and indigenous peoples suggest the attitudes and worldviews within the bioprospecting discourse. Traditional medicine does not have a recognized place in the contemporary landscape of medicine and therefore must be refined. Altering it has primarily arisen through bioprospecting, as allopathic firms seek new core ingredients to develop their products. The clinical trials necessary to screen, isolate and test such material demand the material to be removed from its original context. For example, the spiritual practice that may accompany a plant remedy is not successfully able to translate into the allopathic context. This divergence is primarily due to differing constructions of and values surrounding health.

Support for this conclusion is demonstrated by the patterns abstracted from each resource. I offer a close examination of IEPI's stance in relation to legitimizing traditional medicine to illustrate this point. IEPI does not legitimize traditional medicine in its "traditional" form of treatment, as demonstrated with its portrayal of traditional medicine as a pill. Instead, it acknowledges how it has transformed historically and that its current value resides in the allopathic form through the development of drugs. This has proven to be the largest place to insert traditional medicine on the international level, given that allopathic medicine is currently the mainstream health care system in Ecuador and worldwide.

Traditional medicine also fails to be legitimized in the modern context due to the divergence in health values. Past and present attempts to remedy this have primarily resided in the political realm of patenting. Such efforts stem from the re-conceptualization of traditional medicine as a reservoir of knowledge to draw from in the process of developing new medicine. The question then arises whether patenting is truly effective as a mechanism to protect and modernize traditional medicine.

As a way to investigate this, I first look to how traditional medicine has come to be known as a form of identification for indigenous peoples. They are its creators and primary practitioners. If the objective of patenting TK is to provide equal benefits to indigenous peoples, is patenting effectively addressing this cause? The position of advocacy and protest from indigenous peoples is understandable, considering their shared history of horrific oppression and exploitation since colonial presence. Yet the question remains whether the patenting process truly overcomes this exploitation in the context of bioprospecting. What is contextually lost in this process and is it fully compensated by the laborious procedures for protecting and privatizing TK? In other words, does entering the global legal system truly address the problem of exploitation? Or has this effort for compensation diverged from its goal to the point that it is potentially harmful to its present and future application?

I agree that the pursuit of establishing clear and accountable steps for TK as a property right effectively projects it onto the modern platform. In our current society, economic and judicial frameworks are the primary considerations for assigning value to a given subject. Placing TK under this microscope allows it to become a part of the current dialogue. But does this framework de-contextualize TK to such a degree that it is no longer the same subject? In other words, does the insertion of TK in the property rights lens legitimize the information or completely undermine it all together? To be put into patentable form, it must be removed from its specific cultural locale, but in doing so, much of the significance of the practices, specifically in relation to traditional medicine, are excluded. Considering these new concerns, the representation and role of traditional medicine change accordingly. The patentable form that TK is reduced to is arguably removed from its cultural context and identity. Traditional medicine, being a subsection of TK, is then in danger of being abstracted to a point where it is no longer recognizable to those who practice it.

Fighting on the Frontlines: the valuation of traditional medicine

Before delving much deeper into the implications of current TK patenting efforts, it is important to revisit the fundamental reasons why such an examination is necessary. Traditional medicine is often categorized as a healing relic of the past and understandably so, as it was developed in the pre-colonial time period. Technology focused methods of medicine, such as allopathic, have been developed and implemented since then, often demanding fewer localized resources and effectively saving millions of lives worldwide. So why bother looking back at practices of traditional medicine in Ecuador? What can allopathic medicine gain from such a contrasting construction of health? It is not a question of the medical legitimacy of either practice, but rather the limitations in the allopathic model in addressing the entire Ecuadorian population in their health needs. The percentage of indigenous peoples living in poverty and suffering from the lack of access to appropriate health care facilities is disproportionately high. In stating that health is a right guaranteed by the state, the Ecuadorian constitution took a step towards recognizing the varying health needs of its citizens. The only means to take the next step is to develop an integrated health care model that is interdisciplinary in scope.

I am not suggesting that allopathic and traditional health systems be positioned in the same realm of medical treatment. They are two completely different models and specialize in different areas of health. From its birth, allopathic medicine aimed to treat emergency care and disease control. Traditional medicine used a holistic approach to address a patient's entire well being and thus is more effective in preventative care.

Instead of traditional medicine replacing allopathic, I aim to illuminate the need for their co-operation. It would allow for the maximization of effective health care services in Ecuador. Such suggestions support a patient empowerment model, which is arguably what the restructuring of the constitution aimed to address. It stated that health services are basic human rights and therefore the government was responsible for providing such needs. To truly match these words with physical infrastructure and services, traditional medicine and allopathic models must coexist.

Departure from the Protocol

At this point, I aim to articulate where my research on the subject becomes distinct and applicable. While previous scholars have concluded that biodiversity preservation, sharing of benefits and patenting are the means to absolve TK exploitation, through my analysis, I have found the limitations in these outlooks. This is not to say my conclusions fully diverge from previous research, as demonstrated with my correlation with Pires de Carvalho in that patenting allows indigenous ownership to be re-asserted. In this way, my analysis provides further affirmation of these conclusions. Yet, having broken open the mechanics of traditional medicine within the context of TK and bioprospecting discourse, I have been able to identify several gaps is such suggestions.

To start, the majority of the discourses have used legal and economic mediums to negotiate the role and value of TM and TK. These have come in the form of expanding legal titles of ownership through patenting or calculating the economic potential of plants for drug development. Though these provide a space in which traditional medicine can be re-introduced, they have proven to not fully allow traditional medicine to become a modern practice. Such framing has imposed constraints on how traditional medicine is represented, valued and implemented.

The economic evaluation and legal framework of patenting must be coupled with a re-structuring of the allopathic health care system in Ecuador. Suggesting this is daunting in itself and I recognize the likelihood that allopathic practices will not be altered to the degree that I am promoting. However, if the goal remains to provide "intercultural" health care services nationwide, then the allopathic construction of health must expand its scope. One way to do this is to inlay traditional medicine into the pre-existing mainstream model of allopathic medicine. This has already taken place to a degree in several case studies, including Jambi Huasi, the hybrid clinic in northern Ecuador, which provides both allopathic and traditional health care services. The clinic has been particularly successful in treating indigenous populations because their health values align with the patients, thus gaining their trust and cooperation.

Biodiversity Preservation: a tool of opportunity and danger

The economic medium through which traditional medicine is understood has been in the context of bioprospecting. Bioprospecting has been argued to be a form of biodiversity preservation because it offers a means to assign value to a given ecosystem without excavating all raw materials for market use. However, within this context traditional knowledge has not been honored into its original context. It must be extracted and synthesized into a digestible form to receive sufficient value, which primarily comes in the form of a price tag. Similar to this abstraction process, biodiversity preservation efforts have targeted the economic potential for drug development to prove its worth. In both cases, the economic process of computing value has removed the given subject from its context and thus lost much of its significance.

Negotiating a New Procedure

Though recalculating the price tag for biodiversity preservation has proven to abstract its intrinsic value, it has provided a medium for multiple values to be present. Bioprospecting, in particular, holds the potential to transform this frictional negotiation of values into a hybrid system. The challenge is located in maintaining diverse representation, which is determined by demonstrating the legitimacy of a practice. The case of health values has proven the sheer difficulty in fulfilling this comprehensive representation.

Health values connected to allopathic medicine have gained a dominant position due to their correlation to drug development and global use. Reasons for come from the economic system of assigning values, in addition to the historical trend of newer practices receiving a title of superiority. Traditional medicine, however, has undergone the challenge of gaining legitimate footing through the limitations of economic and legal discourses, as seen through titles of patenting and

property rights. This relationship has created a challenging situation for the Ecuadorian government in developing an intercultural national health care system.

Situating my research in the charged climate of Ecuador allows me to draw out globally relevant patterns of behavior. The case introduces the challenge of negotiating health values across a temporal landscape, as one's historical position has become a direct indicator of legitimacy in the modern context. For better or worse, this linear outlook has placed the most modern practices and health values above more historically rooted ones. Thus, the historical context is actually hindering the attitudes towards traditional practices. As a means to address this temporal limitation, health values must maintain their historical context, but reconfigure the selection and representation process. The pattern has been similar to building blocks as older practices are buried underneath the foundation of new systems of health.

The issue remains that these traditional values and practices still resonate with a large percentage of the population who need to be served by the modern health care system. Therefore, there ought to be a way to draw these populations in through the incorporation of traditional practices into more mainstream allopathic settings. Instead of the tower of blocks, the health system needs to adopt the absorptive properties of a sponge, which would allow traditional values or methods to become enmeshed in the current mainstream practice.

International Application of Values

Such conclusions can be applied to the larger genre of value systems worldwide. As seen in my paper, negotiating different sets of values has often resulted in overshadowing and alienating an entire population who hold contrasting values. This pattern can be identified across the globe, as demonstrated in New Zealand, where traditional practices and perceptions stand in contrast to corporate notions and intentions for water use. The challenge of cooperative water use on the Whanganui and Waikato rivers diverges between two central entities; Genesis hydroelectric dam, a nation-state owned power corporation, and Te Atihaunui a

Paparangi, a Maori tribe. Both parties seek the use and values of the rivers, but one primarily comes from an economic interest while the other is situated culturally and spiritually. The clash in water use agendas has resulted in centuries of tense negotiation between the governmental corporation and the tribe. Unfortunately, this has greatly hindered the level of cooperation and has caused integrated solutions to become stagnant.

Divergent value systems are embodied in case studies across the globe. The current system for prioritizing values has overshadowed other agendas and has resulted in either mono or bi-focused representations of a situation. Overcoming this framing limitation threatens the very linear foundation that has governed colonial and global forces of exchange. Yet, this challenge must be confronted in order to form an effective and practical model where all populations are represented. To bring this goal into fruition, the structure of the value representation process must be rewritten. Current dominant frameworks do not need to be erased as they likely gained their position because they provided effective and valuable perspectives. They simply must adapt more flexible and absorptive boundaries to allow more materials, ideas and values to be translated inside.

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