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JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

TABLE OF CONTENTS

SOCIO-CULTURAL ANTHROPOLOGY

Honor Killings: Remnants of the Past, or Consequences of Recreating the
"Other?" by Jennifer Zelnick
Haverford College
Page 5

Knowledge is Power: Discussions of Women's Authority in Candomblé
by Jessica F. Pires
Colby College
Page 18

Status of Chinese Indonesians in Post-Authoritarian Indonesia
by Jenny Zhu
Haverford College
Page 30

Coping Strategies for Culture Shock as Indicators of Cultural
Identity by Jonathan N. Rempel
Binghamton University
Page 49

BIOLOGICAL ANTHROPOLOGY

Dietary Diversity Associated with Ngöbe Nutritional Status in La Casona
by Jacob Ball
Tulane University
Page 59

Birth Size and Maternal Nutrition During Pregnancy Predict Blood Pressure in Filipino Adults
by Anita Shroff
Northwestern University
Page 73

Tooth Loss Positively Predicts Cardiovascular Disease Risk in Adult Filipino Women
by Junzi Shi
Northwestern University
Page 106

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JOURNAL OF UNDERGRADUATE ANTHROPOLOGY



HOMELESS MAN IN PARIS, BY JACKSON KRULE

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

**HONOR KILLINGS: REMNANTS OF THE PAST, OR
CONSEQUENCES OF RECREATING THE “OTHER?”**

BY JENNIFER ZELNICK
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Abstract

This paper seeks to excavate the cultural significance of honor killings in Turkey. By drawing upon relevant scholarship as well as firsthand ethnographic experiences, this paper examines the ways in which Turks understand honor killings in both the global context as well as within Turkey's unique sociopolitical history. As the relatively young nation-state grapples with issues of identity in the global context, processes of othering and reinscription are illuminated as a means of furthering the country's goal of being viewed as a “modern, Western, European” country.

Olcay: An Introduction to Honor Killings in Turkey

I met Olcay Karalarli in Ankara on my first day in Turkey. She was our tour guide for the Anatolian Civilization Museum as well as the Ulus (old city of Ankara). Olcay introduced herself as a graduate of Sociology from Middle Eastern Technical Institute (METU) in Ankara. She is a self-proclaimed feminist, and a strong Kemalist advocate. Before our tour began, Olcay insisted that we ask her any questions we might have about Turkish history, culture, and politics.

True to her self-identification as a feminist, Olcay interwove examples of what she called “Turkey's liberal gender politics” into the greater history of Anatolia, the Ottoman Empire and the young nation-state of Turkey. From the Hittite's innovations with women's rights in the second century BCE to Ataturk, Olcay repeatedly insisted that, contrary to anything we might have heard or thought about Turkish culture, women were indeed equal citizens.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

After the tour was officially over, I had the opportunity to sit down with Olcay privately. I explained to her that I was majoring in anthropology, and was currently enrolled in a course on Ethnographies of Turkey. She asked me what I was studying, and I explained my interest in gender and sexuality. Olcay then reminded me that she considered herself a feminist and an expert on women's rights in Turkey. She offered to answer any questions I might have regarding the subject. I expressed my interest in honor killings in Turkey. Her facial expression immediately changed from one of curiosity to one of confusion.

I explained that while I appreciated the extremely sensitive nature surrounding the discussion of honor killings, I wanted to ask her some questions about her personal opinion on the topic in order to better understand the issue. I hoped to analyze different perspectives on honor killings by both Turkish citizens as well as the western world Turkey seeks to emanate. Olcay's facial expression changed: she was once again engaged. She began by saying "Honor killings are rural. They happen all over the world, [because] people have possession of women and girls. Especially Kurdish people, in the eastern parts of the country." I then asked Olcay why she thought honor killings take place in Turkey. She responded, "men say it's to protect their honor, but this is nonsense. It's about labor and bride price." Olcay insisted that, in spite of the occurrence of honor crimes in certain rural areas, metropolitan Turkey is currently going through a social revolution of sorts: love marriages, rather than arranged marriages, are on the rise. Additionally, she insisted, when honor killings *do* occur, the government (allegedly) no longer turns a blind eye. Due to new state laws passed in 2004, honor killings are now being punished more severely. "Now we're killing men for killing women," she remarked.

Olcay and I continued to discuss the changing cultural values surrounding love, sex, and marriage in Turkey. When I asked her about virginity exams, she assured me that, like honor

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

killings, these exams were rare and isolated to specific ethnic groups living in rural Turkey. She had personally never heard of anyone she knew getting a virginity exam. According to Olcay, the exams were remnants of “the old, old times, some stupid families- about one or two percent of Turkish society- still do it.”

Suddenly, Olcay got up, explained she was late, and said she had to leave immediately. I quickly thanked her for talking to me, apologizing if I had made her feel uncomfortable. She assured me that this was not the case; she was merely due back at the museum to give another tour. Thus our conversation ended.

Honor Killings and the Social Construction of Namus in Turkey

Honor killings are an international phenomenon, occurring “in communities where the concepts of honour and shame are fundamentally bound up with the expected behaviours of families and individuals, particularly those of women.” (International Campaign Against Honour Killings 2010) Honor killings are committed, typically by male relatives, when a woman transgresses in such a way that the family’s honor is seen as damaged or ruined. *In Honor of Fadime: Murder and Shame*, by anthropologist Unni Wikan explains this is because while “men were in charge of the honor of the family... women, as sexual beings, were potential threats.” (International Campaign Against Honour Killings 2010) A woman may be killed in order to restore her family’s honor for any number of reasons, ranging from divorcing or leaving a spouse, to being raped, to choosing love over arranged marriage, or even dating someone her family disapproves of. Honor killings are designed to restore “men’s power in families.” (International Campaign Against Honour Killings 2010)

In Turkey, “namus” is the social construct of honor as it relates to women’s sexual activity, virginity, and marriage. Often viewed as a historical remnant of the pre-modern

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Ottoman Empire, *namus* invokes family values, and specifically, desires to control and suppress female sexuality. In conjunction with its emergence as a modern nation- state in 1923, Turkey reinvented social, political, and legal conceptualizations of the body and gender identities. Through various means of regulation, the body became a locus for the government to control its citizens. Wikan explains that because “honor depends on control over the female [body,] violence is endorsed if it is necessary to maintain that control. Brothers and cousins are their... female relatives’ keepers” (Wikan 2007, 272).

As Nükhent Sirman states in “Kinship, Politics and Love: Honor in Post- Colonial Contexts- the Case of Turkey,” *namus*’ role in modern Turkish culture is the “[reproduction of] the modern patriarchal gender regime in Turkey” (Sirman 2004, 42). This quotation serves as a reminder that in spite of all the progress the modern nation-state of Turkey has made towards gender equality, inequality is still a reality, and true equality has yet to be realized. Sirman explains that, although the rise of the nation- state signified the evolution of the family unit from loyalty to houses to loyalty to the conjugal unit, this shift from subject to citizen did not eliminate but rather reproduced the state’s need for control. The political structure of the nation-state is reproduced through the construction of the nuclear family. *Namus*, therefore, is a means of linking women’s sexuality to familial integrity. This elevates the importance of the family above that of the individual- just as the house was valued above the subject before the inception of the nation-state of Turkey- because the authoritative relationships present in a family mirror those of the state.” Wikan reiterates, “disgrace or dishonor afflicts not just individuals but the collective [family] as a whole” (Wikan 2007, 272). Furthermore, contrary to Olcay’s insistence that honor killers were now being punished more severely for their crimes, as anthropologist Mikael Kurkiala remarks in “Interpreting Honour Killings: The Story of Fadime Sahindal (1975-

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

2002) in the Swedish Press,” even high- profile cases resulted in lenient punishments. After publicly beating Fadime, her “brother was sentenced to one year’s probation... the [crimes] were culturally sanctioned and designed to uphold a specific moral order” (Kurkiala 2003, 6-7).

In accordance with this power hierarchy, Michel Foucault’s *The History of Sexuality, Volume 1: An Introduction*, states that because sex exists within the structure of society, it functions as a means of control. Sex is thus institutionalized, and, consequently, all sex acts are embedded with moral judgment. Foucault explains, “Power is essentially what dictates its law to sex... sex is placed by power in a binary system: licit and illicit, permitted and forbidden... power prescribes an “order” for sex” (Foucault 1978, 83). Although Foucault’s theory applies worldwide, its relevance in modern Turkey is undeniable. Because sex is “a thing to be... managed, inserted into systems of utility, regulated for the greater good of all... [as] a thing one administered,” (Foucault 1978, 24) transgressions from proscribed family values in regards to *namus* threaten the family’s overall power hierarchy.

As Ayse Parla explains in “The Honor of State: Virginity Examinations in Turkey,” preserving *namus*, specifically through controlling women’s sexual activity, is vital. Like theorist Max Weber’s conception of the state as the one modern institution that monopolizes legitimate violence, (Weber 2005) “virginity examinations must be viewed as a particularly modern form of institutionalized violence used to secure the sign of the modern and/ but chaste woman, fashioned by the modernization project embarked on by the Turkish nationalist elite under the leadership of Kemal Atatürk” (Parla 2001, 66). This quotation reaffirms the state’s desire to maintain control over individuals, specifically women, in order to protect the family. Like Sirman, Parla highlights “a woman’s purity as an icon of family honor” as the rationality behind honor killings (Parla 2001, 77).

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

In 1994, the Human Rights Watch's Women's Rights Project published an article entitled "A Matter of Power: State Control of Women's Virginity in Turkey." As a non-governmental organization (NGO) with worldwide credibility known for their expertise in regards to human rights issues on both national and international levels, this report provides a unique perspective on honor killings in Turkey. This article explored the use of virginity control exams, or "gynecological examinations undertaken to determine the status of the hymen" as a means of enforcing power hierarchies (Human Rights Watch 1993, 2). The article noted that virginity control exams were done both per police officials' request as well as at the request of school administrators and family members. Women accused of prostitution as well as infidelity were subjected to these exams regularly in order to determine not only whether a woman is a virgin, but also if she has recently engaged in sexual activity (Human Rights Watch 1993).

Oftentimes, women in custody are compelled to submit to virginity exams, allegedly "to avoid future accusations of police abuse during interrogation" (Human Rights Watch 1993, 12). If the woman does not agree, the officers oftentimes threaten to rape her and then force her to get a virginity exam (Human Rights Watch 1993, 14). In academic settings, administrators often recommend that parents submit their daughters to virginity testing if the girls have been seen communicating inappropriately with boys. This can include any behavior not approved by the family, such as conversing or spending time with boys in unmonitored environments. Oftentimes the girls preemptively commit suicide upon hearing they will be taken to the doctor for virginity testing (Human Rights Watch 1993, 2).

Both Sirman and Parla recognize the inherent inconsistencies of namus-related virginity exams and honor killings. Although they can indeed be argued as a protective measure, or even as expressions of modernization through reimagining state control, they can also be seen as

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

new symbols of gender inequality. Because women of the new republic were charged with being “unveiled and yet pure, the new woman was to be “modern” in appearance and intellect but was still required to preserve the “traditional” virtue of chastity” (Parla 2001, 75). Thus, although the formation of the Turkish nation- state brought about many facets of modernity, gender equality was still not a reality. The state and the family still controlled women’s bodies and sexuality.

Reconciling an “Outdated Custom” with Current Practices: The Function of Blame

Like Olcay, everyone I discussed honor killings with in Turkey insisted that they are an isolated phenomenon associated with specific cultural subgroups and geographic locales. In Eskişehir, Demet, a student at Anadolu Üniversitesi, told me that honor killings were a “Kurdish problem, [caused by] the PKK [wanting] to divide the country and create a new country in the East.”¹ Demet’s opinions directly parroted those of other university students I spoke with from METU in Ankara to Boğaziçi Üniversitesi in Istanbul.

This opinion is not isolated to the undergraduate community. All literature I encountered, scholastic and fictitious, by Turks as well as by Westerners, equated Turkish honor killings with very specific demographics, such as Kurds and rural villagers in the East. I believe these works drew such strong connections in order to better depict the problem, however I fear that, in placing the blame on these groups, honor killings have been ultimately dismissed as the problem of the minority or “others” within Turkish society.

One case in particular, that of Fadime Sahindal (1975-2002), directly equated honor killings with Kurdish people. In her essay “Rethinking Honor in Regard to Human Rights: An Educational Imperative in Troubled Times,” Wikan begins by informing readers that, while Fadime and her family had been living in Sweden for the past twenty years, her death was viewed as a product of her cultural background, or more specifically, because she was Kurdish

¹Demet, interview with the author, March 8, 2010.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

(Wikan 2007, 272). She remarks that, while “honor killings have [typically] been associated with faraway places and tribal societies, [the assumption that honor codes]... would vanish with the development of modern state structures in which the welfare of citizens no longer depends on their ability to derive support and security from kin connections”(Wikan 2007, 272).

As is evident in Fadime’s murder, this has yet to become a universal truth. The article goes on to explain that although Fadime’s family had been living as immigrants in Sweden for two decades, her parents barely spoke the local language, and did everything they could in order to avoid assimilating into Swedish society (Wikan 2007, 281). Thus, Wikan argued, her family purposefully chose to isolate themselves from the culture in which they lived, and chose instead to cling to their Kurdish traditions. Although they had not lived in Turkey for over twenty years, the Sahindal family remained bound to and marginalized by a system of honor associated with their Kurdish ethnicity.

Zulfu Livaneli, a popular Turkish author, chose to write a novel on the issue of honor killings in Turkey in hopes of bringing the problem to the forefront of the public’s attention. In a speech given in 2006 at New York University, Livaneli remarked that, although appropriate legislation was necessary, laws alone would not solve the problem of honor killings. Instead, he suggested, “what is needed is a change in consciousness, and it can only be achieved through education on the one hand, and economic development on the other” (Livaneli 2006). Livaneli hoped his book *Bliss*, although fictional, would help in this process of education. *Bliss* tells the story of a young teen Meryem who lives in a rural village in the East. At the beginning of the novel, Meryem is brutally raped. The plot follows Meryem in the aftermath of her rape, as her family deliberates about her ultimate faith. The family decides her cousin Cemal, recently returned from military service, will kill her. Meryem was told she was “being sent to Istanbul”

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

(Livaneli 2006, 106). The book presents Meryem and her family in sharp contrast to the various modern people she and Cemal meet over the course of their journey to Istanbul. Additionally, Livaneli portrays Cemal as morally conflicted over his familial obligation. Cemal's love, Emine, reminds him of the legal consequences of killing Meryem, which further complicate the situation. Thus, Livaneli effectively depicts Cemal as a victim of his culture, alongside his cousin Meryem (Livaneli 2006).

Ayşe Onal, a Turkish journalist, conducted a series of interviews with convicted honor killers, resulting in the book *Honour Killing: Stories of Men Who Killed*. Onal explains she embarked on the project in order to gain the killers' unique perspectives on their crimes. Her interviews explored a vast array of killers: from sons to brothers, the seemingly guilt-free to those utterly consumed by regret. Through these interviews, she found that, just as Livaneli depicted Cemal as morally conflicted in *Bliss*, the majority (if not all) of the men imprisoned for killing their sisters, mothers, cousins, and daughters expressed feelings of uncertainty, guilt, or even regret in relation to their crimes.

Murat, convicted of killing his mother Hanim, initially appeared to be particularly unburdened by his crime. However, as the interview progressed, Onal found Murat to be extremely remorseful. He admitted that he killed his mother to stop those who knew of her infidelity of gossiping about his family and their disgraced honor (Onal 2008, 73). Murat described honor killings as a "nightmare that has such tragic consequences for both the person who dies, and the person who kills... you too die with the person you kill... the person you have killed has the same blood as you" (Onal 2008, 72). Thus, Murat expressed his loneliness in prison, and the sadness that he was now eternally burdened by. This interview showed that, while Murat did not directly express regret or guilt about having committed matricide, his moral

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

compass was not set permanently to one side. Murat exhibited compassion, if only for himself and his personal suffering.

Another scenario left an especially distinct impression on Onal as particularly tragic. This was the story of Ilyas, who had murdered his sister. Ilyas had recently been transferred to an agricultural work- prison in Edirne, and, according to Onal, he was a true “victim of fate” (Onal 2008, 126). Onal admitted that before conducting her interviews, she had not believed such a condition to be legitimate. Onal even admitted that prior to speaking with these men, she believed them all to be essentially devoid of morals and good. However, upon meeting and interviewing Ilyas, her opinion clearly changed. Onal remembers Ilyas’ desire to have his story told. Ilyas explained, “perhaps, if you broadcast my story, it will help some of those who see it not to do what they are planning to do. And so my sins might be forgiven” (Onal 2008, 127).

Ilyas killed his sister because of gossip- it was rumored that she was not a virgin, and furthermore, was promiscuous and possibly even a prostitute. Although she denied these rumors, they ate away at Ilyas (Onal 2008, 134). Ultimately, Ilyas became so consumed by these rumors as threatening to his honor that he strangled Aysel in her sleep (Onal 2008, 139). Tragically, Aysel’s autopsy revealed, “[Ilyas’] sister, about whom so much had been rumored for months, had been a virgin... his sister had been a virgin ‘prostitute’” (Onal 2008, 143). This detail is perhaps the most tragic part of Ilyas’ story. Already plagued by regret over killing his sister, the postmortem discovery that Aysel had, after all, been a virgin, completely consumed Ilyas with guilt.

Like *Bliss*, many of the interviews in *Honour Killing* force readers to reconsider preconceptions about convicted honor killers. The story of Ilyas and Aysel was just one of many interviews in Onal’s book that questioned the moral absolutes typically socially imposed on

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

honor killers. While none of these interviews suggested that the convicted men were innocent, or even in the right, the book forces readers to reexamine prejudgments about these killers and question whether their character can be judged solely on one defining action. Furthermore, they raise the question: are such men, in actuality, cultural pawns and victims of circumstance?

Excusing or Marginalizing the “Other?”

While both *Bliss* and *Honour Killing: Stories of Men Who Killed* may successfully bring Turkish honor killings to the foreground, just like Fadime’s story, they equate honor killings with the cultural, ethnic “other.” While this may be statistically accurate, such an association is extremely problematic. In *Fear of Small Numbers: An Essay on the Geography of Anger*, Arjun Appadurai explains that the sheer existence of the minority is a symbol that the majority has yet to achieve complete homogeneity within society. The result is the majority’s anxiety towards the minority, or “other” (Appadurai 2008, 50). One way the majority expresses this fear is through further distinguishing themselves from the minority, and thus, blame enters the equation. The majority group identifies and highlights differences between themselves and the minority, and posit their fear of heterogeneity onto these differences.

Anthropologist Jenny B. White confirms this theory in *Islamist Mobilization in Turkey: A Study in Vernacular Politics* that the process of imagining or creating the “other” ultimately leads to the extremely problematic marginalization of that group. Although the book specifically explores the controversy associated with reconciling the competing ideologies of Kemalism and Islamism in Turkey, the theory extends to the process of creating the “other” through distinguishing cultural groups such as the Kurds or rural villagers in eastern Turkey. White explains that, “[legitimizing] the idealized characteristics of one by demonizing the perceived opposite characteristics of the other” is entirely counterproductive in reconciling different

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

cultures, and ultimately leads to the reestablishment of what the opposing groups view to be irreconcilable differences (White 2002, 29).

Deconstructing Honor Killings as Crimes of the “Other”

Honor killings still occur in Turkey, even if they are infrequent, and only within very specific subcultures and geographic groups. In urban and metropolitan areas of Turkey, those places generally considered to be “Western,” it is customary to refer to such killings as problems that happen far away to religious, traditional, or otherwise primitive people. As demonstrated in the extensive quantity and style of texts about honor killings (academic discourse, non-governmental organization reports, interviews, and works of fiction), recently both Turks as well as Westerners have made concerted efforts to raise awareness about this issue. However, these efforts, while made with the best intentions, reassert honor killings as a problem of the “other.” This is problematic in confronting its occurrence.

While new laws mandating more severe punishments for those convicted of honor killings and honor-related crimes may be curbing the occurrence of such incidents, this has proven ineffective in eradicating its occurrence in Turkey. As Livaneli remarked in a speech about Bliss and honor crimes in 2006, “what is needed is a change in consciousness” (Livaneli 2006). Ironically, this change must include figures such as Livaneli, who through efforts to educate society about honor killings, are, in fact, responsible for its perception as a problem of the “other.” If honor killings are to be eradicated, they must be addressed as problems not of the Kurds, or the rural villagers, but rather as a problem concerning all Turkish citizens.

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HOMELESS MAN IN PARIS, BY JACKSON KRULE



**KNOWLEDGE IS POWER: DISCUSSIONS OF
WOMEN'S AUTHORITY IN CANDOMBLÉ**

BY JESSICA F. PIRES
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Abstract

This essay explores concepts of tradition, power, and privilege. The role of women in Brazilian Candomblé as leaders and as esteemed members of society will be explored. Analysis is done using Ruth Landes's *The City of Women* as an ethnographic source, which is later compared to various perspectives of modern cultural anthropologists.

Vibrant traditions and complex histories characterize many diasporic religions of the Atlantic, as well as the traces of Africa which flow like blood through their veins. Interpolated in the steamy and dark nights of Bahia, Brazil are the myths of a poetic religion: Candomblé. In the 19th century, Candomblé rose through collective slave memories in Bahian *terreiros*, which served as alternate spaces of blackness for freed slaves. This narrative may seem familiar among other religious histories in the New World which draw their origins back to the Yoruba and Bantu peoples. What distinguishes Candomblé from the others are its strict, intricately gendered dimensions of practice and hierarchy. Candomblé communities have historically been recognized as spheres of women's privilege in Brazilian society (Harding 2006, 13). Candomblé pulses in the hands of the women, who channel the verve of folk in Bahia (Landes 1947, 216). As with questions of historical purity, such as *pureza Nagô* in contention with Bantu, scholars have initiated a debate about the importance of women in Candomblé. In recent years, the traditional notions of women as authoritative figures have been challenged to an extent in order to argue measurements of male dominance, exceptions of male leaders, and the transformation of such

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

female-centered standards as Candomblé. However, does this dilute the achievements of women in any way? Does it delegitimize the works of early 20th century anthropologists? All of these issues and questions will be explored through analysis of accounts, ethnographies and scholarly writings spanning the last eighty years of diasporic Brazilian discourse.

My ethnographic basis is a unique example in Brazilian anthropological research. Ruth Landes wrote *The City of Women* after an extended trip to Brazil on behalf of Columbia University. Despite her status as a bona fide anthropologist, the book was initially marketed as a travel narrative, thought to lack ethnographic legitimacy. Reading like a novel at times, these literary elements do not diminish the significance of her findings in a sector of research that was in its infancy.

The time during which Landes toured Bahia is important to note as it can create many gaps, which are necessary to identify in analyzing the text. Landes, alongside Edison Carneiro, conducted her research in 1938, while Candomblé was still considered a cult and was illegal; she recounts many police scares and raids in her book (1947, 34). Due to its illegality, Candomblé remained a secret to many, and had been scarcely written about in fear of revealing the religion to “whites.” As we see later, the idea of secrets in this manner is very important to the understanding of Candomblé and the preservation of its traditions. Another slightly complicating feature is that signs of racism are prevalent, as is expected for the late 1930s. Although this does not present itself in Landes’s written voice, many of the people she interacts with have very strong opinions about race and its place in the social landscape of the United States and Brazil. The terms Negro and Negroid are used rampantly, but one has to acknowledge this as the norm of describing Afro-Brazilian culture in the ‘30s. Additionally, Landes points out the uniqueness of her experience in Bahia as a very light-skinned African-American, saying that the Brazilians

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

almost treated her as a specimen of amazement. Nonetheless, her writing does not seem to be overwhelmingly biased, although it is a first-person account.

Her honest and genuine curiosity is what adds a brilliant light to *The City of Women*. Afro-Brazilian society and Candomblé were entirely new to Landes, and there is value in the fact that she had no experience with it before. The result is a pure reaction that evokes less of an anthropological sense but more that of a curious child. Although a temporal gap exists, Landes's superbly detailed experience is very useful in evaluating the gendered hierarchy in Bahian Candomblé.

A car ride with her companion, Edison, sparks Landes's interest in the topic. She asks, "Isn't it unusual for a woman to be so recognized in Brazil?" Edison replies with arguably the best line in the book, which has been quoted frequently in scholarly evaluations of Landes's research, "Not in Bahia, not in the world of Candomblé. The shoe is on the other foot here. It is almost as difficult for a man to become great in Candomblé as it is for him to have a baby. And for the same reason: it is believed to be against his nature," (1947, 36). This simple yet effective statement is the basis for Landes's argument. Through her encounters with Candomblé women, she continues to show the privilege that comes with being a woman of authority, and opposes this with her preconceived notions that men would reign as religious authorities in most cultures and religions we encounter.

What challenged these notions most was her first experience with Candomblé ritual, during which she was a spectator from afar. She traveled to Engenho Velho, a revered temple whose name translates roughly to "ancient ingenuity," in order to view the celebration of Father Oxalá, father of African gods. The temple itself, describes Landes, is a disappointment in comparison to the grandiose Catholic churches of Bahia, but the experience was like no other

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

(1947, 41). The style of the temple is in direct connection with the pasts of their slave ancestors, an homage to the creators of Candomblé. Three women, Luzía, Eugenia, and Antônia, *mãe-de-Santos*, directed this temple and began the service. Drummers, a role specifically assigned to men, began with intricate rhythms which serve to enchant the gods and coax them to earth (1947, 48). The mothers and their daughters danced in a designated space, opening their bodies to the gods. They try to bring their patron gods down to earth so they can see and hear them. The women are the pathway that bridges the mortal and supernatural realms. This responsibility is most sensational for the women of the temple, and the gods descend into their heads to “ride” them (1947, 37). Through their bodies, the gods dance and talk, against the womens’ will. She and He become one. This spectacle continues, as Candomblé practitioners watch, some enviously, until the gods calm themselves (1947, 54).

As practitioners leave, the ritual is still not finished, and may continue for another two days, according to Landes. The *mães* must literally act as mothers because the spirits, in a fit of reluctance, begin to act as children. This is mirrored in the speech and actions of the possessed women, who beg for food and drink from the mothers in a childlike manner. The mothers attempt to persuade the spirits out of the bodies by marking their necks and arms, important spaces of embodied practice, with purified water (1947, 55,60). After hours or days, the gods finally leave and the women can finally assume control of their bodies once again.

In addition to ritual practices, Landes comments throughout *City* on other duties of the mothers. On a daily basis they lead services and counsel the community on various issues. Yet most importantly, as leaders of temples, they make the executive decisions and serve as the faces for their *terreiros*. This contributes to intense competition between *terreiros* in Bahia as women want to have their temple recognized as the best or most authentic. *Mãe Cleoza* described her

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

services, “We are genuine, they know that everything under my direction comes straight from the old Africans as taught to me by mother Pulcheria,” (1947, 80). This declaration is entangled with so many loaded motifs such as authenticity, purity, and connections to the homeland. However what it shows that is of paramount importance in Candomblé is the passage of information through women to their daughters.

From Landes’s work, conclusions can be made about women’s roles as *mães e filhas*. Clearly women are revered as the connection not only to the life beyond but also to the past, the past of slaves and of Africa. Preserving ties to Africa was a crucial dynamic in the origins of Candomblé, and the responsibility which lies in the hands, feet, and bodies of the women. Candomblé has always been centered on hard labor, and such physical aspects are observable in several facets of the religion. To start simply, motherhood is venerated in Candomblé; a practitioner in *City* exclaims, “It is a calamity to have no mother! A mother is gold! She carries you in her body, she delivers you with pain,” (1947, 230). Birth and pregnancy, in Landes’s book, is respected as a symbolically significant rite. Additionally, motherhood is so important that orphaned children or men who have lost their way are expected to live under the care of the *mãe-de-Santos*, who, although they might not be actual mothers, are anticipated to serve as collective mothers to the community. She writes, “For the men, the temple’s a home, an easy and affectionate place with many mothers who give and take love,” (1947, 146). Women are often portrayed carrying the community, and the specific image of a hunched woman with nearly unbearable weight comes to mind in reading the various literature on the topic.

Rachel Harding writes of the physical burden of the resonances of the religion in women’s bodies specifically through dance (D: 18). As seen in the prior ritual description, dance is of central relevance in Candomblé. Bastide claims that all religion is a tradition and that such

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

traditions are a binary mixture of stereotyped actions and rites (Bastide 1960, 240). The idea of tradition as action that Bastide introduces is particularly useful in evaluating Candomblé dance. Tradition in Candomblé is identified by myth and knowledge of the past and as dance calls to the gods of Africa, women are simultaneously entranced in the present and past, sharing every fiber with a spirit. Candomblé myth is not necessarily shared orally because of its complexities. Rather, dance is a means of experiencing knowledge that is not otherwise transferable. Dance is a way to express a relationship to history and to ancestry from the movements of her body from “within the deepest memories of one’s own cells,” (Harding 2006, 17). The daughters of the gods are aware that their motions speak a language which recounts the journeys of *vouduns* and *orixas*. Bastide writes that myths, such as origin stories and tales of African gods, only survive as a definition of the rite, and that only by allying with the actions are the myths saved from extinction (Bastide 1960, 241). Although he acknowledges the significance of embodied practice, Bastide takes issue with rites as a transfer of historical knowledge: “Myth now survives only through its connection with ritual and in passing from one generation to the next, from mouth to mouth, it has lost its original richness of detail and been reduced to a mere explanation of certain actions,” (Bastide 1960, 241). His theory is not alone in opposing Landes and Harding in this way, which will be described thoroughly later.

Women’s embodied knowledge is not only relevant to dance but also to the propagation of Candomblé. A *Mae-do-Santo*’s role includes transmitting information from one generation to another which will subsequently be passed along to following generations (Harding 2006, 13). In the same vein, all priestesses are to emulate their predecessors (Landes 1947, 109). A Candomblé leader is supposed to know everything, *sabe tudo*, which means access to the well-kept, seemingly dangerous secrets of the religion (Johnson 2002, 30). Most Candomblé

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

ethnographers have been struck by the paramount function of *the* secret. It is accepted in the religion that the higher one's rank, which is expected to be a woman's position, the closer you are to the secrets. Not one person knows everything, but each leader knows a piece of the puzzle. The fear is that the secret would be revealed to whites, which would mean that the religion would be subjected to outside, non-African influences and thus dilute the authenticity of their practices (Johnson 2002, 30).

Another fear, however, is that of an uncertain future of Candomblé. Bastide, in relation to the issue of collective memory, argues that the hierarchy of the secret is dangerous as a factor in the disappearance of memories over time (Bastide 1960, 249). Additionally, a favorite *terreiro* topic is the lack of respect for age and social structure in contemporary Candomblé. Johnson touches on nostalgia amongst elders of "how things used to be" (2002: 34). Even in *The City of Women*, published fifty-five years prior to Johnson's work, an older man worries that, "The young ones don't want to know the truth. They are after show and money and noise. But the important truths are to be kept quiet and secret...The young ones blaspheme-it all shocks me," (1947, 30). I can imagine he may be speaking directly about young women who do not want to become mothers, or who are unable to manage a temple the way their predecessor did. The temporal gap between the elderly and youth only widens the spatial gap between Brazil and Africa, which endangers the authenticity of Candomblé, a chief concern which is only an additional burden to the shoulders of women.

In consideration of these surmounting burdens, how can it be claimed that women are actually maintaining authority rather than becoming victim to their unwavering devotion? The debate on the topic is fervent, as observable in anthropological literature about Candomblé. The focal point is on the polarity of male and female roles in Candomblé. Moreover, most critique is

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

tangent with Landes's work, but not all of it is positively related. Nonetheless, most agree that Landes remains as an exception among anthropologists (Capone 2010, 185).

The concern is that Landes argued in favor of total control on the behalf of women as prime religious authorities. Perhaps in her experience religious leaders *were* exclusively women and that the *mães* were supreme in the religious community. This is where the temporal gap becomes problematic, because many critiques are written decades after Landes's expedition. However, Rachel Harding and Paul Johnson do agree with Landes in a few areas. In Harding's experience, she did see women's dominance in ritual and leadership. Daily life in religious sects consisted of a series of private rituals and services, performed by the daughters of the gods. She also proposes that the women absorb, carry, and wrestle with the history of Candomblé, the ghosts of slavery, and survival of the religion. They are charged with sustaining an ancestral link to Africa, which remains at the heart of Candomblé (Harding 2006, 12). Although she describes it with trepidation, Harding mentions that Candomblé women are believed to be more suited to accepting gods. Through her interactions with Mãe Stella, Harding writes that the mother believes women make better Candomblé leaders because of their natural maternal qualities as well as an ability to be responsive to the *orixás* (Harding 2006, 12). Landes states that it is in the popular mind of Candomblé practitioners that women are calm, rational, logical, and in control of their emotions, which is favorable for spirit possession. She describes that men's blood is hot, as if boiling with carnal desires, which is offensive to the gods, while women are cool (Landes 1947, 38, 98). Landes's companion Edison Carneiro adds that if a man were to be possessed, he is thought to be a homosexual.

Johnson agrees with Landes, in that men are proving their manhood by not dancing (Johnson 2002, 45). Landes described signs posted throughout the temples reminding men that

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

they are forbidden from participating in the dance ritual (Landes 1947, 54). Johnson adds that this still holds true for heterosexual men of Brazil; in the old days, "*antiguamente*," men would never dance and certainly never be in trance (Johnson 2002, 44). He then describes an encounter with a drummer who spoke of men, who wished to be priests, of being "cock up, ass down," lying prostrate and vulnerable to the women. Easily, the man was describing a loss of manhood as the men were assuming a feminine sexual position. Johnson notes, however, that groups of effeminately gay men, known as *adés*, are known and esteemed for their flamboyant, showy style (Johnson 2002, 45). Conceivably, such homosexual priests are a rarity considering traditional Brazilian sexual ideas. On the contrary, Johnson acknowledges a rise in Candomblé communities headed by men, but it remains important to mention that Johnson's work was published in the early 21st century. In tangency, he raises two vital questions: Do women experience power? Does it translate into transformations of machismo? He answers simply yes to the first and no to the second (Johnson 2002, 48).

It is not that scholars deny that women assume roles of power in Candomblé, but rather that they deny that such roles give women agency. In opposition to Landes, Bastide and Clarke argue that Candomblé is not immune from the effects of polarity between men and women in western culture. Clarke criticizes Landes for identifying women as the only spiritual passages, which he believes is a generalization of the religion (Clarke 1993, 103). Furthermore, he argues that women are actually victims during spirit possession. In possession rituals, gods are supposed to be male and mount the women who are supposed to be horses or wives (Clarke 1993, 97). As they ride the women, they take all control of their will. He mentions that not all women enjoy or desire the possession experience, as Landes made it seem to be (Clarke 1993, 101).

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Clarke also argues that the intense interdependence between women and gods only further exemplifies their submission. It was explained that women are chosen as priestesses or daughters to be possessed because of their docile characteristics, yet Clarke argues that this perpetuates stereotypes of women as subservient to the dominant male figure (Clarke 1993, 109-110). He repeatedly refers to the women as devotees, and emphasizes that their lives revolve around serving their male gods through labor and domestic means. A combination of these factors serves symbolically to reinforce perceived notions of male power and domination while women remain as servants (Clarke 1993, 109). The question arises: does this delegitimize Landes's argument?

Critics of Landes, strive to incorporate male priests into the social landscape of Candomblé. Capone distinguishes that in other sects of Candomblé, such as Umbanda, men assume leadership roles, specifically heterosexual men (Capone 2010, 144). Bastide claims that Candomblé is "utilitarian, even in its ecstasies, in the plunge into the vast, dark night of trance" (Bastide 1960, 249). Such a statement would surely puzzle Landes. These changes can be connected to modernization and a simple passage of time in Candomblé. Evidence, in the time that Landes published her book, suggesting that men could be priests or participate in trance is unfounded, as little information existed about Candomblé. However, it seems more likely that as Candomblé gained popularity and publicity it transformed as it extended its roots and branched into other areas of Brazil. It could be argued that despite scholars' assertions, Candomblé remains in the hands of women.

As can be seen through the vast selection of literature, gender in Candomblé is richly complex. Although there exist tensions between men and women, especially concerning female independence in society, the unique power structure in Candomblé still exists in opposition to

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

most other religious hierarchies. Interpretations of power dynamics and gender relations are endless, as is the debate. To borrow Johnson's words, interpretation is "always able to be critically turned back on itself" (Johnson 2002, 46). Despite this, is there any justice being done by arguing that mothers experience suppression rather than empowerment? Is there a level of violence being done to Candomblé women through the proposition of such ideas? Even if it is that they are not as powerful as once perceived, does not success exist in the fact that they have served their gods to their best abilities, and acted as mothers to entire communities? Scholars offer no condolences, thereby unintentionally appearing to undermine Candomblé. It would be more productive if, despite new findings and modern thought, Candomblé women were left on top where they should stand proudly.

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JOURNAL OF UNDERGRADUATE ANTHROPOLOGY**HOMELESS PERSON IN VENICE, BY JACKSON KRULE**

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY
STATUS OF CHINESE INDONESIANS IN POST-
AUTHORITARIAN INDONESIA

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Abstract

This research paper documents findings from original research and fieldwork regarding the status of Chinese Indonesians within Yogyakarta, Indonesia. Following the post-authoritarian and violent government regime under Suharto, in which many alleged communists were massacred and discriminatory laws enacted, many Indonesians have been reluctant to speak of past atrocities and have internalized a new sense of democratic freedom. One minority group that was unfairly treated throughout Indonesia's history under the colonial and Suharto regimes was the Chinese Indonesians. This research serves to examine whether discrimination still exists towards this particular group and the implications of perceiving a fully reformed democratic society. Having participated in ten weeks of fieldwork through a summer internship, these results are limited in their applicability to all Indonesians. However, with supplementation from other academic works on this particular topic, it is possible to propose that discriminatory attitudes still exist and many Chinese Indonesians have been silenced for the purposes of "furthering democracy."

In the summer of 2009, I, along with six other American students, participated in a ten-week research-based internship in Indonesia in partnership with local NGOs and Indonesian research students. After an intensive two week Indonesian language and cultural immersion course in Yogyakarta, Java, we relocated to Bali to attend a month long research methodology and ethics class with seven other Indonesian students. Anthropologists Leslie Dwyer and Degung

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Santikarma were the core instructors, but visiting Indonesian and American scholars, who specialize in other methodological approaches, also provided additional instruction. Having had limited knowledge of Indonesia's political and social situation prior to arriving, the research methodology classes served as a stimulating overview of the circulating debates regarding the progress of Indonesia's transitional government among human rights activists. With the fall of President Suharto's 40-year violent dictatorship, Indonesia has gained international recognition as a newly emerging democratic state. While the country has experienced a surge of public elections and political changes, our class discussions and materials challenged these international reports on Indonesia's perceived development by recognizing the unaddressed social problems under its reformed government and the lack of public acknowledgement regarding the abuses suffered under Suharto's regime. The notion of freedom and the complete rupture from Indonesia's history with human rights violations was therefore questionable.

Though critical of current reformative changes, we also recognized the multi-ethnic and diverse nature of Indonesia that would complicate any single approach or solution for a peaceful and truly "free" society. One of the many reasons Indonesian citizens were opposed to Suharto's regime was his rigid conception of an Indonesian nation state that excluded and systematically targeted many types of minority groups based on political affiliation, ethnicity, religion, etc. Therefore, in order to envision a truly accepting, democratic, and plural society and to promote social change, the transitioning government must address past grievances and incorporate these minority groups and concerns into the new national landscape. Within this context of identity intolerance and political abuse, interest in race relations surfaced. It was possible to question whether this nationalistic ideology still persists in the post-Suharto era and whether minority groups have in reality been incorporated into the new political order.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

For the remaining four weeks, we were dispatched to our respective NGOs that provided us with general guidance in conducting a short research project on a pertinent social justice issue in Indonesia. We also worked collaboratively with an Indonesian student partner who shared similar research interests. The author worked with Andre Liem, who is also ethnically Chinese, in examining the history of and ongoing discrimination towards Chinese Indonesians.

After much discussion with Liem on our specific interests and questions, we proceeded to conduct observational fieldwork in the small Chinatown located in a busy tourist district in Yogyakarta, Java. We also read literature that ranged from historical accounts of the Chinese Indonesian community under colonial rule to recently published literature on the community's post-reformation status. After gaining a better understanding of the historical context and sense of the community through observation of a predominantly Chinese neighborhood, we then interviewed various Chinese Indonesian students from a nearby university and also spoke with university professors who have published work on the Chinese Indonesian population. Our NGO and interviewees then provided us with additional contacts. These contacts were leaders of various Chinese organizations or belonged to the older generations that experienced overt discrimination under Suharto.

In recounting the mistreatments under Suharto's regime, it is widely understood that the ethnic identity of Chinese Indonesians was deemed illegitimate and counterproductive to national unity and progress. As a result, Chinese Indonesians have experienced a history of political and economic exploitation and social rejection. Current proponents of Indonesia's success with democracy and development deny any form of racist ideology and claim ethnic intolerance only occurred in the past. From personal discussions with Liem and other Chinese Indonesians regarding the recent anti-Chinese riots in 1998, there seems to be a gap in

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

perceptions of a post-racial discriminatory society and the reality of this minority group's experiences.

Before beginning discussion on the study and conclusions from the internship, two important points regarding the contents of this paper must be acknowledged. First, in addition to some supplementary theoretical readings and other ethnographic pieces, the fieldwork that was conducted serves as the primary support for the analysis of the status of Chinese Indonesians in the reformation era. Therefore, the conclusions are limited in their applicability because only a very selective Chinese community in Yogyakarta was interviewed. The depiction of how Chinese perceive themselves in a new age of democratic development thus only reflects these voices and is by no means encompassing of the vast and diverse makeup of the Chinese populations within Indonesia.

Second, it must be acknowledged that the Chinese were not the only victims of Indonesia's authoritative regime and Suharto did not only politically and socially target groups on the basis of ethnicity. Therefore, the findings in this paper should not be interpreted as strictly a "Chinese problem." Instead, the consequences of democratic discourses and freedom ideologies can be made applicable to any victimized or minority group within Indonesia. The analysis of the Chinese population is then only a subtopic within this larger discourse of controversies surrounding democratic development that can hopefully contribute to the overall effort of making these discourses more apparent in Indonesia's current political arena.

An understanding of why Chinese Indonesians themselves internalize notions of a post racial society and knowingly deny instances that prove otherwise is crucial. In what ways is the post-racial attitude among Indonesians a potential byproduct of democratic ideology and jargon that provide illusions of freedom? What political or social role will they have as an ethnic group

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

in new conceptions of a tolerant and democratic state? How do Chinese Indonesians understand the meaning of democracy and the “freedom” they are now given? What forms of discourses and influences have contributed to their overall attitudes regarding race, democracy and identity? The focus is therefore on the ways in which these discourses have affected how Chinese Indonesians perceive *themselves* and manage their dual identities within this transition period to a democratic state.

In order to understand the continued presence of ethnic discrimination in the newly emerging democratic state of Indonesia, we must first examine the long history of discriminatory treatment towards the Chinese that has continually manifested itself in subsequent governmental regimes. The origins of these racist ideologies can be traced back to the treatment of the Chinese under colonial rule with the systematic differentiation of the Chinese from their Indonesian counterparts. Prior to the colonization of Indonesia by the Dutch, the Chinese have experienced a long history of peaceful relations with the *pribumi*, the indigenous Indonesians. The migration and presence of the Chinese in Indonesia began over 400 years ago, as groups of Chinese traders and seamen started to settle in port cities in increasingly large numbers. Through intermarriage and adaptations to local customs and norms, Chinese migrants were well integrated and accepted by local populations. Many did not even speak any Chinese dialects at home (Freedman 2000). Not until Dutch colonizers enforced a formal system of rule to exert control over local populations, did the relationship between the *pribumi* and the Chinese become adversarial over political, social and economic reasons.

Dutch colonizers established a system of indirect rule using the “colonial caste structure” tactic, in which Chinese were used as middlemen to collect taxes and govern communities of local Indonesians (Mackie 1976). This tactic directed all local antagonism towards the Chinese

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

even though they were not directly benefiting from any of the tax collection or from the direct control over their governed communities. Dutch authorities were essentially creating a social hierarchy among the Indonesian populations, in which the Chinese were increasingly characterized as middle-class citizens who had a lower status than European colonizers but a higher status than indigenous Indonesians. Consequentially, as the Chinese started to fill more economic roles, in a political economy divided by race and class, indigenous working-class Indonesians became gradually more hostile towards the Chinese and resentful of their more “privileged” status under colonial rule (Freedman 2000).

The Dutch granted the Chinese a measure of local autonomy to govern themselves, which enabled them to solidify as an ethnic community through the establishment of Chinese schools and organizations. This also served to distance them from other Indonesians. As a result, the ethnic Chinese were perceived as a very homogenized community reflecting specific stereotypes and social roles. There was great diversity within this small minority group. The *totok* immigrants and Indies-born *peranakan* distinction is perhaps the most pertinent during this time. The *totok* immigrants were part of a second wave of Chinese immigrants into Indonesia in the early 1900's. They were unfamiliar with local customs and retained very distinct cultures and languages. These immigrants came mainly for economic reasons and occupied positions of skilled labor, such as businessmen or tradesmen (Mackie 1976). This population further exacerbated stereotypes of the rich Chinese businessmen. Thus, even within the Chinese community itself, there exists a cultural and linguistic chasm in which indigenous *peranakan* identified more with the Indonesian locals and customs than their *totok* Chinese counterparts (Freedman 2000).

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

The Chinese in Indonesia were progressively more exploited and rejected by both colonizers and locals. With the increased bitterness towards their economic prosperity and autonomy, local Indonesians treated the whole Chinese community as a distinctive group who threatened their status in Indonesia. They became the “ethnic other,” in which local Indonesians perceived the Chinese as economic and political competition and as an exclusive and pretentious social group that was loyal to the Dutch (Coppel 1983). Moreover, during this time, there was a rise in the mainland China nationalist movement. This movement beckoned the return of Chinese diasporas. Because the Dutch feared the local Chinese would decide to return to their homeland, the colonial power started to enforce tighter restrictions and formal control over the community. The Chinese were forced to declare their loyalties to the Dutch by applying only for Indonesian citizenship and were implicitly told to exhibit less cultural ties with China (Freedman 2000). As a result of feeble ties with both local Indonesians and colonial authorities, the Chinese were treated as scapegoats during the economic downturn that occurred alongside the fall of colonial power.

Dutch power came to an end in 1945. President Sukarno became the first publicly elected official under the new independent Indonesian state. Sukarno not only had the difficult task of establishing a new nation, but he also had to address the worldwide economic depression that plagued Indonesia at the time. As poverty became more widespread, all blame was shifted towards the Chinese. They were treated as the economic backbone under colonial rule and, thus, were believed to be the main contributor for the nation’s economic problems (Lindsey 2005). Consequentially, there was a surge of anti-Chinese violence and regulations with two of the most devastating events being the Chinese trade ban in 1959 and the May riots in 1963. The rising nationalistic sentiments and the outburst of anti-Chinese attitudes led to a state-wide ban of

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

“foreigner” businessmen, which included the Chinese. As a result, roughly 136,000 Chinese Indonesians immigrated to China because they no longer had any means of economic livelihood in Indonesia. In 1963, there was also a series of sporadic and violent attacks on small Chinese communities in West Java that mainly destroyed property with limited bloodshed (Mackie 1976).

President Sukarno tried to resolve the ethnic tensions by promoting his vision for a multiethnic, diverse and tolerant Indonesian nation state. Because of these open and dynamic discourses on national identity, proposals of the integration or assimilation of the Chinese began to emerge with the rise of two significant political organizations: Baperki and Lembaga Pengembangan Kehidupan Beragama (LBKP) (Freedman 2000). Baperki was committed to ending discrimination towards the Chinese and advocated for the integration of the group by recognizing them as an ethnic group of equal standing in Indonesian nationalism. LBKP, on the other hand, advocated for assimilation of the Chinese with the most extreme approaches being complete abandonment of all facets of Chinese identity and the embracing of local cultures. President Sukarno generally favored the Baperki integrationist approach, and because Sukarno’s policies generally leaned towards the political left, Baperki became increasingly associated with the Indonesian Communist Party (PKI). This relationship would eventually contribute to increased stigmatization of the Chinese after the complete obliteration of the left under Suharto’s dictatorship (Purdey 2003). Both Sukarno’s attempts to include the Chinese into the national landscape and the increased protection offered by Baperki and LBKP resulted in the temporary decrease of violence and hostility towards Chinese Indonesians. Unfortunately, this progress came to an abrupt stop when Sukarno was ousted from power in 1965.

In 1965, an anti-communist faction led by Major General Suharto carried out a military take-over of the Indonesian government with the justification that they were stopping a

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

communist coup from taking control of the country. Suharto then became president of Indonesia. His presidency lasted for over 40 years and his regime was known for its support of a modern industrial economy, state-led massacres, abuses towards alleged communists, and a series of laws that furthered an inflexible concept of national identity to exert mass control. Suharto's political intolerance for identities and behaviors that deviated from his concept of nation-state prompted systematic techniques to ensure complete homogenization. This process effectively denied any notions of an ethnic Chinese identity (Coppel 1983).

In addition to dissolving the perceived leftist Baperki organization and the massacre of alleged Chinese communists, Suharto further targeted the Chinese by enforcing the Assimilationist Program. This program mandated identification with one of only five accepted national religions, the nationalization of private schools, the ban of ethnic materials or cultural activities, immigration restrictions, and active declaration of Indonesian citizenship or the Surat Bukti Kewarganegaraan Republik Indonesia (SBKRI) system (Freedman 2000). Moreover, many Chinese were urged to limit the use of Chinese dialects and Chinese names in order to further national unity and progress (Suryadinata 1997). Thus, these laws can be construed as Suharto's adoption of the colonial control tactics, in which "systematic discrimination against the ethnic Chinese in Indonesia had become firmly fixed in a web of ambiguous relations and less ambiguous policies" (Lindsey et. al. 2005, 42).

Similarly to Suharto's continuation of ideologies from colonial rule, the reactions among the Chinese were also consistent with those exhibited under colonial times. During Dutch colonial rule, the Chinese generally established a strategic relationship with government officials in order to gain protection from local hostility. This resulted in the Chinese passively accepting political and economic forms of exploitation and abuse (Suryadinat 1997). During Suharto's rule,

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

he established close connections with Chinese economic advisors to further economic development. Though many Chinese businessmen profited during Suharto's reign, it led to many local Indonesians resenting the entire Chinese ethnic group (Coppel 1983). Around the time that Suharto began losing power, the economy also began to weaken. The Chinese once more became the economic scapegoats. Their communities were violently raided and attacked and there was a mass exodus of the Chinese from Indonesia. This further emphasizes the notion that the Chinese were consistently exploited economically and politically throughout Indonesian history (Freedman 2000).

Suharto lost power in 1998. Indonesia entered the reformation period. Its transition to a democratic government began under the popularly elected leadership of Megawati Sukarnoputri, the daughter of former President Sukarno. The new government experienced a series of political reforms with the abolishment of suppressive laws and a surge of democratic processes such as elections. Notions of freedom and democracy permeated the national mindset as the current government was perceived as a complete break from the authoritarian abuses of past regimes. Issues, such as ethnic discrimination, were no longer perceived as problems and there was an understanding that a democratic society equated a post-racial society. Thus, issues such as racism and political intolerance were only part of the historical past, which can be safely avoided by furthering plans for democratic progress.

These changes have, however, been limited and superficial in ending discrimination towards the Chinese. Some indicators of the continued presence of racist sentiments was the outbreak of anti-Chinese violence in many large cities throughout Indonesia in 1998 and the reformed government's failure to identify these perpetrators and abolish legal mechanisms for anti-Chinese discrimination, such as the SBKRI system. These unaddressed issues along with the

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

routine level of local discrimination that Chinese Indonesians still experience allude to the questionable nature of “freedom” under the democratic state. This paper will now discuss a few consequences of democracy discourses that have politically silenced Chinese Indonesians and have effectively undermined any impression of ethnic discrimination. These discourses have been strategically utilized to facilitate skewed understandings of democracy, participation and national identity amongst Indonesian citizens. In particular, these discourses have impacted the older generation of Chinese Indonesians, who experienced overt forms of discrimination, and the younger generation in different ways.

One significant outcome of the transition to a democratic government is the social immobilization of local populations, as they do not demand governmental accountability or social and political change. Through systematic forms of propaganda that circulate definitions of democracy, citizens in transitioning governments, such as Indonesia, can be discouraged from challenging the new democratic government. Voicing discontent would potentially risk destabilizing the progress of democratic development. Julia Paley’s analysis of the democratic ideologies after the fall of Pinochet’s violent dictatorship in Chile supports the notion that officials can “convince popular sector organizations not to march by attributing to them the responsibility for upholding the national project of democracy” (2002, 116). Moreover, these governments can strategically manipulate the fears of a post-dictatorship society by depicting the lack of democratic progress as being equivalent to the return of an authoritarian government. Citizens would then feel “obligated to support the government and its actions because to do otherwise was to invite what was considered the only other alternative: authoritarian rule” (Paley 2002, 116). These understandings of democratic development and the pressure to accept any

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

flaws within the new system have legitimized irresponsible governments that do not address past or current social grievances.

The attitudes among the older Chinese generation in Indonesia largely reflect this passive acceptance of a superficial democratic government. As a result of Chinese Indonesians experiencing cycles of political exploitation and unaddressed abuse, the older Chinese generation has come to understand the concept of democracy as merely a process of popular interest enacted through systems of voting and elections and not an accountable institution that secures or protects their freedoms (Lloyd & Smith 2001). Through the various regimes, the Chinese have in some ways adapted a survival mentality and have a general tendency to avoid political troubles in order to guarantee the safety of their ethnic community. They have consistently adhered to an exploitive relationship with the government not only for monetary reasons, but also to sustain a level of autonomy and governmental protection from local hostility. Thus, this ethnic minority has over the years become increasingly exclusive due to social segregation and politically uninterested as their experiences have undermined any conception of an accountable government that protects and accepts their ethnic identity.

This lack of confidence in political participation is discussed in Arief Budimen's concluding remarks regarding the Chinese attitudes towards politics.

"Feeling that they were not fully Indonesian, they did not consider that they could legitimately become involved in politics. They were afraid that they would be called 'intruders'. Many Chinese parents therefore advised their children not to join political rallies or student demonstrations against the government. They commented that the Chinese were simply immigrants, 'guests' in Indonesia, so they did not have the right to decide the future of Indonesia" (Lindsey 2005, 99).

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

As a result of Chinese Indonesians being treated as outsiders and often times a national enemy, they have accepted that they can never achieve political influence as an ethnic minority and will forever only be bystanders to social and political change and abuse.

The Chinese Indonesians from the older generation who were interviewed all reflected these socially immobile outlooks and advocated assimilation and “ethnic invisibility” for safety and convenience. Lucinda M. Lett, a professor at Atmajaya University, did not want to be associated with Chinese political or social organizations and is generally uninterested in politically advancing the Chinese community. She does, however, generally support the need for a supportive Chinese community and better education and familial support in order to counteract the “gap between the Chinese and non-Chinese, which stems from the spread of stereotypes from the colonial age” (Discussion August 1, 2009). While she recognizes the legacy of institutional abuse that has contributed to current forms of discrimination, she shifts her criticisms to local community groups instead of demanding state-level accountability which is an attitude that results from social immobilization.

Additionally, Budi Setiagraha, the head of PITI-Yogyakarta, a Moslem-Chinese organization, felt the “Chinese must convert to Islam and become integrated into the Indonesian majority in order to maintain good relations and a harmonious social life” (Discussion August 3, 2009). Thus, in order to incorporate themselves into the Indonesian national identity, Chinese Indonesians must actively undermine their right to embrace any cultural aspects that deviate from the social norm.

Because of the effects of social immobilization, many Chinese Indonesians do not demand government acknowledgment or effort to reconcile any of the instances of anti-Chinese violence or discriminatory government regulations. Chinese Indonesians are thus “engaged in a

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

process of reworking emotions and overcoming difficult memories for the purpose of national reconciliation” (Paley 2002, 128). This is a process of reconciliation that helps the group devalue the need for a truly representative government, an institution that they have already convinced themselves as unattainable. Mely G. Tan has observed this complicit attitude among her subjects as “almost all of them accepted the regulation of 1967 on restricting expressions of Chinese culture within the family environment or temple grounds” (In Surydinata 1997, 50). Chinese Indonesians were thus burying their past and denying the presence of ethnic discrimination in order to not challenge the current democratic system. Furthermore, they might even deny the presence of ethnic discrimination for the sake of contributing to a façade of national development.

Dr. Liem Sioe Siet, a member of the Atmajaya Yogyakarta Education Foundation, reflected this internalized understanding of a post-racial society under the new democratic government. He felt “racial discrimination does not exist in Indonesia now” and that it was merely a past “economic and political issue” that occurred because the Chinese had a weak position (Discussion July 20, 2009). Because the government has historically failed to address ethnic discrimination, Chinese Indonesians have consequentially denied their own unjust realities in order to cope with what seems to be an impossible endeavor to become accepted into the Indonesian nation state as an ethnic minority.

Many local Chinese Indonesians have thus become complicit and accepting of bureaucratic abuse and the hardships faced daily. Instead of trying to rally for change, they have systematically tried to become less ethnically conspicuous by limiting the use of any ethnic markers, such as Chinese dialects and Chinese names. One of the interviewees, Bimo Yuwono, secretary of the Chinese organization INTI-Yogyakarta, acknowledged that he had initially

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

legally changed his Chinese birth name to an accepted Indonesian name because of the bureaucratic issues . But after the formal legislations to change Chinese names was abolished, Bimo did not change his name back “out of practicality” (Discussion July 29, 2009). In reality, many Chinese Indonesians have decided to not use Chinese names to avoid exploitation under the current regime. The price for public school tuition is one such instance of apparent discrimination within public institutions that is recognized and unchallenged. Students who are identified as Chinese on their applications due to their Chinese names are charged more for public school tuition. As a result of this situation, Bimo, Lucinda, and Bernie all decided not to give their children Chinese names. These discriminatory practices also explain why many Chinese Indonesians do not speak any Chinese dialects in public. A twenty-nine-year-old Chinese man born in Semarang said “I can speak Chinese, but prefer to use Indonesian only with my wife and children, since I do not want my children to be disadvantaged at school” (Surydinata 1997, 48). From these interviews, it is possible to see the skewed logic behind understandings of democracy and participatory citizen, as citizens are “working together to solve their own problems and build their own future” (Paley 2002, 145). This reduces government obligation and provisions to address local needs. Chinese Indonesians are, thus, strategically concealing their own identities to avoid instances of ethnic discrimination instead of mandating change that would make it socially acceptable to exhibit ethnic culture.

While the older generation’s experiences have been explored, it is important to demonstrate that these democratic discourses impacted the younger generation in a different way. This generation did not suffer explicit forms of ethnic discrimination and were not consistently exploited by government authorities. They are mainly influenced by discourses on modern conceptions of the self that are less focused on the political past and issues of

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

discrimination. Furthermore, parents have encouraged assimilation and acceptance of instances of ethnic discrimination and thus have taught their children to implicitly deny their own ethnic identities by following Chinese rituals in an inconspicuous manner and denying the presence of racist ideologies with the justification that Indonesia is now a free democracy.

One negative consequence of these discourses is the creation of fractured identities among young Chinese Indonesians. They are unable to balance the realities of dual identity experiences. This fractured identity results from what philosopher Stefanie Pandolfo perceives as the effects of a global movement towards modernity that embraces concepts like democracy and rejects the traditional past. In other words, this process of modernization ignores the need to reconcile the past and only stresses the advancement of ambiguous standards of development without acknowledging the realistic ability to do so. The “modernist passion” is thus the “desire for a new self, and a sense of break from the past, from ‘culture,’ understood both as a mode of colonial subjection and as the source of an identity that is no longer one’s own. An identity that inhabits the present as phantasm” (Pandolfo 2000, 129). In terms of the process of transitioning to a democratic nation from an authoritarian past, these discourses of identity overlook any traces of social injustice, such as ethnic discrimination, that might have trickled down from colonial times to the current political situation. In reality, these discourses still exist in Indonesia because the Chinese continue to be treated as an ethnic other by their Indonesian counterparts.

Various interviews have emphasized that Chinese Indonesian youths are succumbing to pressures to deny ethnic discrimination with historical roots and to only embrace a futuristic, idealized Indonesian identity. Mely G. Tan interviewed a *peranakan* born in Bandung who felt “we are Indonesians first ... the trend in the cities is toward loss of Chinese identity” (Surydinata 1997, 46). Furthermore, all the young Chinese Indonesians interviewed in this study identified as

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

“purely Indonesians” and only recognized their Chinese identity as part of their family lineage. One of the interviewees, Agus Lie, had an even more extreme understanding of his Chinese identity. He sees no value in making his Chinese identity publicly explicit to others. He thinks issues of racial or ethnic discrimination are only applicable to his parent’s generation and is of no concern or relevance to his current status in Indonesia (Discussion July 29, 2009).

While all of the above interviewees shared sentiments that ethnic discrimination is not a large issue in Indonesia, they also told similar stories about the forms of discrimination they experienced as children. Many of them were teased and socially isolated because they “looked” Chinese and “practiced” Chinese by eating pork or speaking Chinese dialects. Many of them were initially confused by this unfair treatment as they saw themselves as equals with their classmates. They soon realized these instances were forms of social discrimination. As a result, many confused Chinese youths started to resent their Chinese identity. When ethnographer Donald M. Nonini asked Leni, a Chinese Indonesian woman who migrated to Australia, to recount her experiences with ethnic discrimination in Indonesia, she said:

The prejudice I faced everyday was very great ... my friend, in one school classroom repeatedly asked me ‘Are you Chinese?’ And then there were my feelings of embarrassment and anger with my mother for speaking ‘that language’
 – Peranakan – when she visited my school, and I said, ‘Mummy, don’t speak that language, it can get me into trouble’” (Day 2007, 112-3).

The youth therefore directed their anger towards the Chinese community and the ethnic identity. They did not look for historical explanations to contextualize their experiences, but instead relied on their parents who told them to passively accept it and move on. The young Chinese Indonesians, who are disconnected or ignorant of their historical past as a targeted ethnic

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

minority, are thus thrust into a state of confusion because their realities do not reflect their ideologies. They are told to disavow racism and to perceive themselves as purely “Indonesia.” Yet, they are still experiencing the realities of ethnic discrimination on a regular basis. They are treated as inferior ethnic others.

From these ethnographic interviews and supplementary theories on the consequences of democratic discourses, it is possible to begin to understand how Chinese Indonesians and other victimized minorities in Indonesia have come to conceptualize their new democratic government and freedoms as participatory citizens. These findings support the notion that perhaps the currently perceived free democratic state is not completely disconnected from the oppressive systems of past regimes and more importantly, that Indonesia has not yet achieved a post-discriminatory society. With this in mind, minority groups need to be wary of their government’s democratic progress and to continually question and hold authorities accountable. Otherwise, overly eager acceptance of a successfully transitioned democratic society can potentially lead to social immobilization and individual denial of social inequalities. This is reflected in Chinese Indonesians’ perceptions of their ethnic status. Therefore, in order to truly achieve a democratic Indonesian nation state that is tolerant and accepting of minority groups, local populations need to dynamically interact with their government in hopes of developing a genuinely representative and accountable government.

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HOMELESS MAN IN PARIS, BY JACKSON KRULE

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

**COPING STRATEGIES FOR CULTURE SHOCK
AS INDICATORS OF CULTURAL IDENTITY**

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Abstract

When individuals relocate to an environment vastly different from their own, they often experience culture shock. Methods of coping with culture shock differ cross-culturally; by noting how people endure culture shock, one can determine how they form their cultural identity. Culture shock appears to be most common when the relocation occurs between a Western country and a third-world country, and for this reason research has been limited to Americans traveling to India, and Indians immigrating to the United States. Previous research by Anderson indicates that Americans tend to form their cultural identity based on memories and experiences, while Mehta et al., showed Indians use tangible possessions to maintain their sense of self. This difference can be attributed to the distinction between the two cultures.

Introduction

The concept of culture shock has been interpreted in a variety of ways, both by people who have experienced it and by anthropologists studying it. Most generally, culture shock can be defined as “the process of initial adjustment to an unfamiliar environment” (Pedersen 1995, 1). Most, if not all, people who travel to a foreign country – whether for a temporary vacation or to make it their permanent residence – experience culture shock of some sort. Culture shock is common when one travels from a Western society to a third-world country, or vice versa. During the adjustment period that invariably follows relocation, coping strategies differ cross-culturally, and such differences reveal how different cultures form their identities. The goal of this research is to compare experiences of culture shock from the perspectives of two types of travelers: one

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

to, and one from, a third-world country. In order to make the analysis as specific as possible, the investigation has been restricted to focus on the nations of the United States and India. Understanding the adaptation required in order to cope with a new host culture can help one recognize the marked differences between two very different societies.

The term *culture shock* was coined by renowned anthropologist Kalervo Oberg in a speech he gave in Rio de Janeiro, later published as an article. In his speech, Dr. Oberg suggested that culture shock is experienced through three main stages. During these stages, initial ethnocentric thoughts eventually give way to a more culturally relativistic outlook. The first stage of culture shock is what Oberg calls the “Honeymoon Stage” (1960, 177). This phase takes place during the first few weeks in the host country, and is characterized by a fascination with the culture that is so vastly different from one’s own. Individuals tend to associate with people who share their culture, and are polite and courteous to foreigners. For short visits – indeed, such as honeymoons – the experience never progresses past this stage. But for more permanent stays, one finds that the feeling of novelty wears off.

The second stage, referred to as the Negotiation (or Disintegration) Stage (Pedersen 1995, 79), begins once the individual realizes that he or she must live with his or her new culture. It is characterized by a “hostile and aggressive attitude” towards locals (Oberg 1960, 179). This stage is caused by all of one's difficulties collapsing upon them all at once: trouble in school, language barriers, difficulty shopping, etc. During this stage, one feels as if all his or her troubles are the result of locals trying to make life difficult for them; the phrase “it's all *their* fault” is common during this phase, and one may resort to false stereotypes to try and comfort himself. This stage is associated with the low point in the U-curve of adjustment to life transitions suggested by T.L. Coffman and M.C. Harris. According to their model, transitions such as cultural displacement

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

start at a high point, followed by a rapid downward slope. After reaching the bottom, the individual experiences a rise to a level comparable with his initial thoughts and feelings (1984), as demonstrated in the third stage of culture shock.

The third and final stage, the Adjustment Stage, is associated with recovery and a greater sense of cultural relativism. According to Oberg (1960), this stage begins when criticism from the Negotiation Stage turns into a sense of humor regarding their situation. The third stage is largely one of acceptance of one's circumstance. At this point the individual has grown accustomed to his or her new environment, and acceptance develops into enjoyment of the food, places, and people. At this point, if the individual were to return to his place of origin, he or she may experience what is known as *reverse culture shock*, or re-entry shock, after having grown so accustomed to his host culture (Oberg 1960, 180).

Reverse culture shock can be considered a fourth stage, and it occurs once an individual returns home and is overwhelmed (or underwhelmed, as the case may be) by the everyday life that he or she had previously taken for granted.

Americans Traveling to India

In 1971, anthropologist Barbara Gallatin Anderson wrote a paper in which she related the experiences of herself and 14 other American scholars when they participated in a culture-change experiment in India during the previous summer. In the opening paragraph, she makes the point of saying that "none of us escaped culture shock" (Anderson 1971, 1121). Anderson does not take the expected approach of delving into the difficulties she and the others experienced during their three-month program that caused her culture shock. Instead, she chooses to analyze how the team slowly adapted to the sudden change in surroundings via explanation of dreams experienced during each of Oberg's three stages of culture shock. She

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

noted that the dreams the scholars had were similar, and changed as they adjusted more and more to their environment.

During the first days and weeks of the study (corresponding with Oberg's Honeymoon Stage), the scholars discovered that they were not dreaming of those they left behind: not friends, colleagues, or even family. Instead, they found themselves dreaming of memories far into their past, such as childhood friends and old neighborhoods in their hometowns. Family and friends did not make an appearance in dreams until the second phase (the Negotiation Stage), and when they did they were distant. One professor dreamed of speaking with his wife, "from the doorway" (1122). Another dreamt about lunch with a colleague, but the large size of the table made conversation difficult. Also in this phase, participants noted having dreams about Indians doing things that were decidedly American, such as playing cards, smoking, and speaking with perfect American accents. In this regard, there seemed to be a blending of Indian and American cultures. Overall, it became clear that the coping strategies relied upon by the American scholars focused primarily on memories of their homeland, and that Americans tend to use experiences as the basis of their identities (Anderson 1971).

Anderson wrote that in the third phase, there was a clear division between the cultures, as people began to have dreams in which "Americans were Americans and Indians were Indians" (1971, 1122). She suggests that the reason for the initial dreams was that the scholars needed something from their past they could remain anchored to, that was unaffected by the trip to India. While past childhood friends could not be affected by the trip, current marital and friendship ties that were (temporarily) broken up by the study were more likely to be pushed to the back of their minds. When the time came to return home at the program's conclusion, the scholars experienced

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

reverse culture shock as they grew concerned about needing to go back into the “rat race” and began to long for “their India” (Anderson 1971, 1124).

Indians Immigrating to America

A 1991 study conducted by Raj Mehta, an assistant Marketing professor at the University of Cincinnati, focused primarily on Indian immigration to the United States, and how Indians try to maintain their cultural identity even when they are far from home. Basing his information on heavy research, Mehta states that physical possessions often play a large role in the cultural identity of Indian immigrants (1991, 398).

Families with objects that express their identities tend to bring them when they move, in order to “transport” their former identities into the household of their new one. Such objects are typically placed within the new home in order to ease the transitions between cultures. Installing these transition objects in the new home help to personalize it. Said one immigrant: “Slowly it is becoming our house. With each new coat of paint, each box unpacked, each tile set into place, we begin to feel our presence in its past . . . We treat the house, the house which is slowly becoming ours, with some respect. We, after all, have moved into it . . . We renovate, renew this structure, make changes. Slowly it is becoming ours” (Mehta 1991, 399). Surely, personalizing one's home with transitional objects ties the home to one's cultural identity.

Just as maintaining possessions from home defines an Indian immigrant's cultural identity, so does the appropriation of American possessions. When an individual relocates into a new culture, it can be difficult to maintain every part of his former culture, and he often find himself adopting American items in addition to his Indian objects. This action represents the mixing of American and Indian cultures, and shows that the individual is somewhere between

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

stages two and three of Kalervo Oberg's classic model of culture shock. This also indicates that the immigrant's integration into American culture has begun (Mehta 1991, 401).

Discussion

The experiences associated with culture shock are due primarily to the differences between an individual's home culture and his host culture. Language barriers and differing customs and social norms can make a traveler feel lost and alienated. It is no surprise that when every aspect of life for an individual is completely changed, he has trouble adjusting to his new surroundings – in short, culture shock results when one is simply not used to his environment. The United States and India are no exception to this, and the two societies differ largely in many aspects.

One of the main differences between the two societies is the difference in social structure. Americans have the ability to climb the social ladder through hard work and determination. As a result, the social statuses of Americans are largely achieved. Meanwhile, India is a society that is strictly stratified according to the varna/jati system. This separates different classes based on birth rather than achievement, and as such social statuses are ascribed. Indian society is rigid, and mobility is nearly impossible. The harsh inequalities caused by this system results in a large proportion of the population living below the international poverty line – approximately 42 percent according to a recent press release by the World Bank (2008), about four times as much as in the United States. With such a large number of impoverished people living in India, living conditions across much of the country are abominable in comparison to conditions in the United States, and such conditions make the transition difficult for American immigrants.

The United States and India also vary largely in their primary religions. The United States' religious makeup is largely Judeo-Christian, with around 80 percent of Americans

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

practicing either the Jewish or Christian faiths (Pew 2007). Indeed, the very nation itself was founded upon Judeo-Christian ideals, with early American law based heavily on parts of *The Old Testament* such as the Commandments. The primary language of these groups in the United States is English, and although there is no official national language, 30 of the 50 states have adopted English as an official language. Most of the major sacred days in the Judeo-Christian faiths are federally recognized holidays, and on these days government institutions are closed regardless of the religions of their employees.

On the other hand, the religious makeup of India is largely Hindu. 80 percent of the Indian population practices Hinduism (Census 2001). Just as the Judeo-Christian faiths played a large role in the formation of the American state, Hinduism played a powerful role in the shaping of early Indian history. Indeed, the caste system that still exists in Indian society can trace its roots to the four-varna system of Hinduism: the brahmins, kshatriyas, vaishyas, and shudras. The most-spoken language in India is Hindi, with approximately half of the populations as speakers. Of all the nationally recognized festivals in India, by far the most are from the Hindu faith. Such festivals are much more elaborate than holidays in the United States, with dancing, singing, and worship of the different Hindu deities.

A third major difference between the two societies is the cuisine. Because the United States is a “melting pot” of hundreds of cultures from around the world, Americans have an impressive choice of delicacies from nearly every country imaginable, from Argentina to Thailand to Greece. Of course, due to assimilation and globalization the dividing lines between the cuisines have blurred somewhat to create a new, “American” cuisine (a number of Chinese restaurants in the United States offer french fries), but generally there is still enough differentiation to maintain diversity.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

India is not nearly as much of a melting pot as America is; immigration to the United States is high and more or less constant, while there is much less immigration to India. The reason for this could be the vision of America as the “land of opportunity,” and indeed it is for this reason that many choose to relocate to the United States. Due to the small trickle of immigration, Indian culture is not as susceptible to change, and cuisine remains “Indian.” Americans who have grown accustomed to their melting pot of cuisine may find it difficult to find food they enjoy in India, especially due to the widespread, extensive use of spices, herbs and vegetables that Westerners might not be able to handle.

These three main aspects are only a tiny fraction of all the differences between the United States and India. One could fill volumes with every minute detail and nuance of the norms in each culture, what actions are appropriate in different situations, and how history shapes the social, political, and economic climates in both nations. It is for these reasons that an individual would be affected by culture shock differently depending on the culture he came from.

Possibly the reason Indian immigrants tend to rely on objects to ease the transition is because the society they are used to is more traditional than the one they are joining. American society is generally very materialistic, fast-paced, and places a strong emphasis on the buildup of personal wealth. Strong criticism of this type of lifestyle may lead Indians to want to bring something to remind them of simpler times, when life wasn't so full of hustle-and-bustle and family was the priority. Perhaps, without these transitional objects, Western society would completely overwhelm immigrants into an extreme state of culture shock.

Conclusion

Certainly, all experiences of culture shock are different. There is no set path that everyone necessarily adheres to strictly, following cultural displacement. The two examples

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

discussed earlier are merely two possibilities out of countless others. However, travelers generally tend to follow the three stages of culture shock put forth by Kalervo Oberg, as well as Coffman and Harris' U-curve model.

Because experiences of culture shock differ cross-culturally, the coping strategies used in situations of culture shock differ accordingly. Generally, by observing the coping strategies that individuals use in cultures so vastly different from their own, it can be determined how these cultures maintain a sense of self-identity. In the case of Barbara Gallatin Anderson's study in India, the American scholars held on to their American values by remembering important events, people, and places from their childhood. Meanwhile, Raj Mehta's study revealed that Indian immigrants use possessions from home to represent their cultural identities, and to remind them of home when in a foreign country such as the United States. Each culture has their own way of self-identifying as a result of socioeconomic conditions, and American and Indian cultures are no different.

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JOURNAL OF UNDERGRADUATE ANTHROPOLOGY



FISHERMAN IN MARSEILLE, FRANCE, BY JACKSON KRULE

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

DIETARY DIVERSITY ASSOCIATED WITH NGÖBE
NUTRITIONAL STATUS IN LA CASONA

BY JACOB BALL

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IN CONJUNCTION WITH EMILY LARKIN, LISA PODOLSKY, AND KATIE STRANDBERG

Abstract

The following research was conducted in Costa Rica through Duke University and the Organization of Tropical Studies. The objective of this study was to determine if there is a relationship between dietary diversity and nutritional status of the indigenous Ngöbe population of La Casona, located in the Coto Brus cantón in Puntarenas, Costa Rica. Seventy-five adult subjects, ages 18 to 77 years, completed a verbal questionnaire of 50 questions and free-listing section to assess the nutritional domain of their diet. Height and weight were measured for each subject to compute Body Mass Index (BMI), an indicator for assessing nutritional status. The study aimed to prove that greater dietary richness correlates with a BMI closer to or within normal range. However, richness of food groups and gender were found to be positively correlated with BMI (adjusted $R^2=0.09$, $p=0.013$). Simpson's Diversity Index was used to determine the diversity within each food group. The most diverse group was vegetables and the least diverse was grains. Large proportions of proteins and grains suggest sufficiency in zinc, iron, vitamin C, and folic acid. The Ngöbe diet includes vitamin B₆ from grains and fruits, but the low amount of fruit in the diet makes it difficult to determine if these levels are sufficient. Because greater proportions of protein come from beans rather than red meat, adequacy of vitamin B₁₂ in the diet is inconclusive. Due to an overall lack of fruits, vegetables, and dairy, it can be suggested that the Ngöbe diet is also insufficient in calcium and vitamin A. Future research can focus on these potential nutrient deficiencies in order to improve overall nutritional status of the community.

Introduction

Proper nutrition is an asset to human life. Scientific evidence has shown that early nutrition affects key risk factors for developing chronic degenerative diseases during middle and late life (Dwyer 2006). Overall, good nutrition can reduce the risk of common diseases, including cancer, type II diabetes, and obesity. Through nutrition, management of symptoms for already existing health issues is possible (FDA 2010). The direct influence of nutrition on health status and morbidity makes longer life feasible, while minimizing chronic disability. A more diverse diet is necessary to obtain suggested levels of micronutrients, rather than from a single food item. Zinc, iron, calcium and folic acid, along with vitamins A, B₆, B₁₂ and C can be used as indicators of overall micronutrient intake (Daniels 2009).

In recent years, the entire Latin American population has experienced an increasing prevalence of chronic diseases in association with changes made to the traditional diet, which consists of cereals, vegetables, legumes, roots, and grains. There has been a gradual transition from these foods to foods that are high in sugars and fats (Bermudez 2003). Like many indigenous groups, the Ngöbe population of La Casona, in the Coto Brus *cantón* of Puntarenas, Costa Rica is isolated both physically and culturally from mainstream Latin American communities, limiting access to nutrient-rich and diverse foods (Hollowed 2009). It has been shown that nutritional deficiencies tend to be more prevalent in rural and marginalized communities and populations with a lower socioeconomic status, such as La Casona (Bermudez 2003). Thus, we expect to find a deficiency of one or more micronutrients in the Ngöbe diet according to internationally recommended intake values.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Currently, no research exists on nutritional deficiencies in the Ngöbe population of La Casona. In studying dietary diversity in relation to BMI, one can gain an understanding of nutritional status, an indicator of the risk to develop certain nutritional diseases (FDA 2010). This study also uses adherence to internationally recognized food group (WHO 2000) and micronutrient intake standards (FAO 2007) as proxies for nutritional status.

The objectives of this study were to determine if greater dietary diversity correlates to a BMI closer to or within normal range, and to determine if divergence from the recommended dietary intake indicates potential micronutrient deficiencies.

Methods

Literature Analysis

Literature was reviewed in order to acquire knowledge on nutritional habits of the indigenous Ngöbe people of Costa Rica from an OTS student project by Madolyn Hollowed from the spring of 2009. Previous studies were consulted to determine which micronutrients would be useful in assessing deficiencies as well as standards for which to compare daily food consumption (Daniels 2009).

Sampling and Interviews

Households in La Casona were selectively sampled to complement Hollowed's previous data collection. A goal sample size of 113 was determined to obtain a 9% confidence interval, using Creative Research Systems survey software. In total, 107 adults, 18 years of age and older, both male and female, were sampled. Only information from 75 individuals ($n_f = 40$; $n_m = 35$) was used to conduct analysis, due to incomplete data.

The majority of interviews were conducted at households in various neighborhoods, including La Casona, Caño Bravo, Pita, and Las Vegas. Additionally, convenience sampling

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

was used to interview respondents following community events, such as church services and English classes, in hopes of reaching male respondents who are absent from households during the week.

Structured interviews, consisting of a questionnaire and a free-listing section, were conducted after obtaining verbal assent. The questionnaire lasted about 15 minutes and contained questions regarding gender, age, number of children, access to health care, household food preparation, daily food intake, and anthropometric factors. The free-listing technique was used to record all food eaten the previous day, specifically at breakfast, lunch and dinner, in hopes of determining the scope of the respondents' dietary domains.

Body Mass Index

Data collection for Body Mass Index (BMI) was carried out using measurements of height and weight (kg/m^2), using a measuring tape and a scale. Percentage of body fat was not measured due to clinical restraint and lack of resources. Nevertheless, BMI was an adequate measure to provide an estimate of body composition (American Heart Association 2010). Although waist circumference is a more accurate determinant of nutritional status for males, BMI was used for both male and female for consistency.

Analysis of Data

Following the completion of fieldwork, data was compiled into a spreadsheet using Microsoft Office Excel[®]. All food items mentioned were classified into different food groups according to WHO and FAO guidelines (Table 1). Simpson's diversity index for all food groups was then calculated to illustrate the food variety within the population. Linear regressions were performed to understand if there were relationships between richness of food groups and BMI and between richness of food items and BMI. Multi-linear regressions were performed with SPSS software. All regression results were compared to a significance of $p= 0.05$.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Percent composition of respective food groups in the observed diet of the population was determined. This was compared to the CINDI Dietary Guide recommended percent composition of food groups (WHO 2010). The micronutrient composition of the most prominent foods in each food group was qualitatively assessed to determine potential nutrient deficiencies (FAO 2010).

Results

The calculated BMIs were separated by gender and categorized as “underweight”, “normal weight”, “overweight”, or “obese” by the WHO BMI classification system (Table 2). The distribution of BMI classification in the different genders (Figure 1) was then plotted. 63% of females and 43% of males are either overweight or obese. No females are underweight. Women are more likely to be obese than men.

The number of items in each food group, the food group’s richness, can also be seen in Table 1. Richness of food groups mentioned per respondent was calculated and related to BMI using linear regression. There is a general positive correlation, going against this study’s hypothesis. However, this factor alone was not statistically significant. When a multi-linear regression was performed, it was determined that richness of food groups has a significant, positive correlation to BMI when gender is taken into account ($p=0.013$). An adjusted R^2 value of 0.09, 9% of the BMI distribution can be explained by richness of food groups when gender is factored in.

A Simpson’s diversity index was calculated for each food group and then graphed in order to compare the relative distribution of foods throughout the community (Figure 2). Vegetables are the most diverse with a value of 0.608, while grains are the least diverse with a value of 0.444.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Using frequency of times mentioned and number of portions eaten per day, the percent of the overall diet that each food group constitutes was calculated. This was then compared to the WHO CINDI recommended diet composition (Figure 3).

The diet consists of 1.68% dairy, just over 10% of the daily recommended intake; fruits and vegetables are present in approximately half and 42% of the daily recommended quantity, respectively. Proteins, grains, and fats are in excess in the Ngöbe diet. The Ngöbe diet does not meet or even approach the recommendations set by the World Health Organization (WHO). Using the percent composition of each food in every food group and literature analyses, a qualitative assessment of micronutrient intake was possible, which was then compared to the Food and Agricultural Organization (FAO) and WHO recommendations. There are potential vitamin A and calcium deficiencies in the diet, while iron, zinc, folic acid and vitamin C are suspected to be present in sufficient levels. It is inconclusive whether or not potential deficiencies in vitamins B₆ and B₁₂ exist (FAO 2002).

Discussion

The comparison of the food group make-up of the Ngöbe diet to WHO recommendations suggests that there is an imbalance in the dietary intake, and potentially in the level of the micronutrients that correspond to the various groups. The cognitive domain of the Ngöbe regarding food diversity in the community is low, having only 32 total food items mentioned. This speaks to a potential problem in the community with accessibility to dietary variety, reasons for which could be financial or geographical. As previously stated, food diversity in a diet increases the likelihood of meeting suggested micronutrient levels (Daniels 2009). Because of the limited cognitive domain and the noted food group imbalance, overall dietary richness is low which increases the likelihood of having micronutrient deficiencies in the diet.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

All of the micronutrients assessed in this study were selected based on previous research, and, like all micronutrients, have important physiological roles. Vitamin A is important in retinal function, red cell production, and gene expression. Vitamin A is found mainly in vegetables, which the Ngöbe do not receive in sufficient quantity, making a deficiency likely.

Calcium is an essential component of the teeth and bone structures, which help give humans the ability to pursue subsistence. It is often found in dairy, the food group of which the Ngöbe only receive 10% of the daily recommended values; therefore, it is suspected that their diet has a calcium deficiency.

Vitamin B₆ is involved in neurological function and development. It is found in high quantities in plantains and bananas, which constitute the majority of the fruit food group in their diet. But because they do not meet the recommended intake of fruits, no conclusion can be made as to whether or not there is a potential vitamin B₆ deficiency.

Vitamin B₁₂, too is involved in cognitive function, but also plays a role in red blood cell formation and DNA synthesis. The micronutrient is mostly found in red meats, which make up a small percentage of the overall protein consumption. However, it is also present in some grains such as rice, and in yucca, which are eaten in excess, making the determination of a potential deficiency inconclusive.

Zinc, iron, folic acid and vitamin C have been determined to be present in sufficient amounts in the Ngöbe diet. Zinc aids in the protein synthesis, wound healing, and is part of many enzymes. Iron is part of hemoglobin, which enables red blood cells to carry oxygen throughout the body. Folic acid helps in DNA synthesis and repair, and it is also a cofactor in many chemical reactions. Vitamin C is involved in synthesizing collagen, which makes up a lot of body tissue, as well as boosts the immune system.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

One reason for the positive correlation between dietary diversity and BMI could be that after naming a grain and protein, usually rice and beans, the next item mentioned is a member of the “fats and sugars” group, or an item without substantial nutritional value. The linear regression was significant when gender was taken into account. The women in the La Casona Ngöbe community suffer from obesity in a greater proportion than men. Most of the men in the community are employed in jobs requiring labor-intensive work in agriculture fields or otherwise, which could explain the relatively low obesity incidence in the population. The women are responsible for cooking, taking care of the children and the home during the day while the man works. In general the Ngöbe women have sedentary lives, only leaving the home to purchase groceries or socialize with neighbors. Without exercise there is a low caloric expenditure, and gaining weight is possible.

Teenage motherhood and multiple pregnancies are common in the Ngöbe community. If the sedentary lifestyle of a house wife starts at a young age, it is possible that the baby weight gained from each pregnancy is not lost, and that the weight compounds with each additional pregnancy.

Conclusion

Limitations

There are a variety of possible errors in the execution of this study, and in the statistical analysis. During data collection there was no Ngöbere-Spanish translator, making communication with some respondents difficult. Spanish was a second language for both the researchers and for many of the respondents, so information was bound to be lost in translation. The interviews had to be done within a short time frame, consisting of two weekdays and a weekend, making reaching the target sample size difficult due to the geographic distribution of

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

houses in La Casona. The interview itself, written by Fullbright Fellow Madoyln Hollowed, contained many questions not pertinent to this study.

There was resistance by the Ngöbe men in participating in the interview, wary of the research intent and of divulging personal information to non-community members. Of five researchers four are female, including Hollowed. As a result, societal gender roles may have further discomforted the men of the community. One researcher is male, making it inappropriate for him to take the measurements of female respondents. These limitations in giving surveys slowed down the data collection process further.

When organizing the data, one researcher was inputting the data while the rest read aloud numbers and food names. It would have been very easy for an input error or a misreading to have occurred, and because of the nature of the original spreadsheet it would have been near impossible to find and correct any mistake.

Additionally, the qualitative assessment of micronutrient deficiencies is possibly indicative of true deficiencies in diet, and thus an area to look into for future research. Clinical restraints prevented blood work from being done as to find the exact amount of each micronutrient that the community is receiving.

Future Research and Recommendations

This study should serve as the foundation for the Health Area of Coto Brus and the La Casona EBAIS for future research into the nutritional status of the Ngöbe people. Looking into quantifying the micronutrient analysis through clinical work would allow for a definitive conclusion as to whether nutrient deficiencies exist. Additionally, a longitudinal study should be conducted following the Ngöbe school children, who eat 2 balanced meals daily at school. They could be followed through adulthood to see if and how their diets change. An investigation into

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

the distribution of food purchased at *pulperías* versus home-grown sources could yield interesting results.

A possible intervention that could help improve the overall nutritional status of the La Casona community is encouraging home-cultivation of vegetables and fruit trees, like banana. Nutrition education classes stressing nutrition impact on health could aid in empowering the community to eat better and live healthier lives. A governmental intervention to subsidize or improve access to dairy and fresh produce could improve overall health status and have an impact on obesity prevalence.

Concluding Points

Dietary diversity in the Ngöbe community of La Casona is positively correlated with a higher BMI. The burden of obesity is unequally shared between men and women. Adherence to WHO guidelines for food group intake is a useful indicator for potential micronutrient deficiencies and for overall nutritional status.

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Appendix

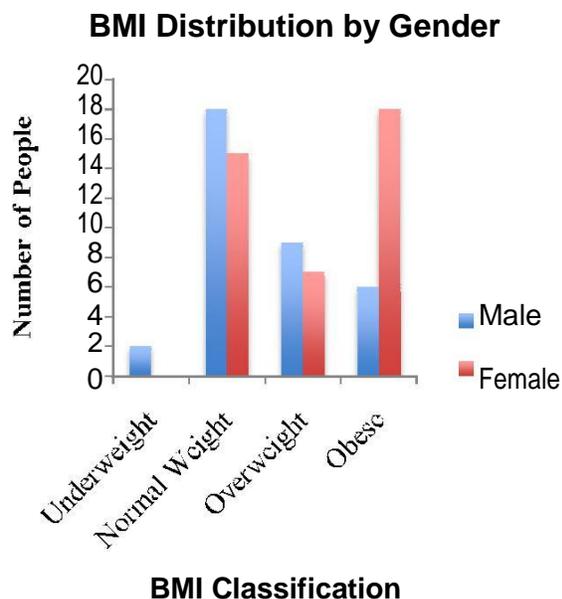


Figure 1. Gender comparison of BMI distribution in La Casona.

Diversity Within Food Groups

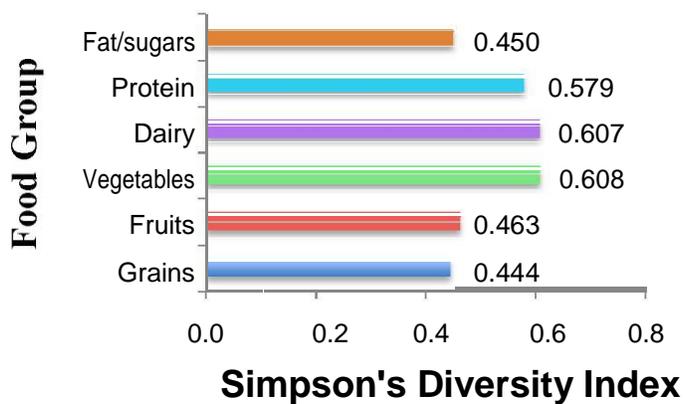


Figure 2. Comparison of diversity within food groups using Simpson's Diversity Index.

Food Group Consumption in the Ngöbe Community Compared to Recommended Daily Consumption (WHO)

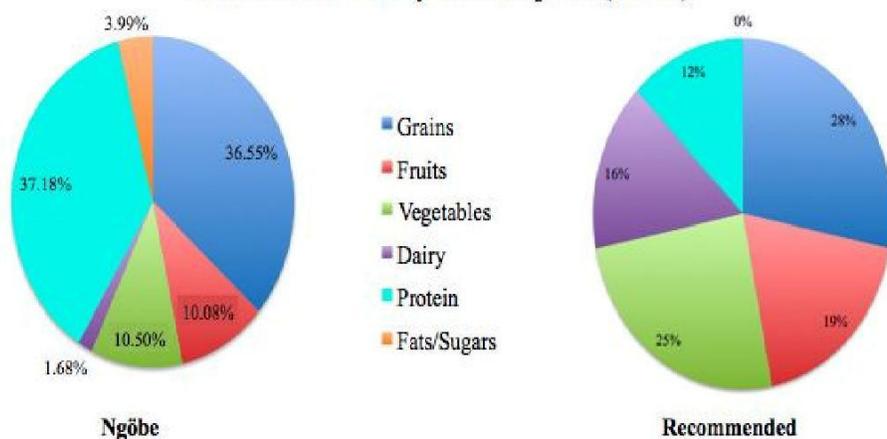


Figure 3: Comparison of Ngöbe food group intake to WHO CINDI recommendations

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Grains	Fruits	Vegetables	Dairy	Proteins	Fats & Sugar
Bread	Banana	Chayote	Cheese	Beans	Candy
Cassava	Lime	Chili pepper	Milk	Chicken	Chips
Cracker	Pineapple	Maize	Sour cream	Eggs	Fruit juice
Flour	Plantain	Mixed vegetables		Fish	Soda
Pancake		Tomato		Beef	
Potatoes				Pork	
Rice				Tuna	
Spaghetti					
Tortilla					

Table 1. Dietary richness and domain: Thirty-two food items mentioned, categorized by food group.

Classification	BMI (kg/m ²)
Underweight	< 18.5
Normal range	18.5 to 24.9
Overweight	25.0 to 29.9
Obese	30+

Table 2: WHO classification body type system based on BMI

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JOURNAL OF UNDERGRADUATE ANTHROPOLOGY



STREET SCENE, PARIS, BY JACKSON KRULE

**BIRTH SIZE AND MATERNAL NUTRITION DURING
PREGNANCY PREDICT BLOOD PRESSURE IN FILIPINO
ADULTS**

BY ANITA SHROFF
NORTHWESTERN UNIVERSITY

Abstract

An adverse uterine environment is thought to program blood pressure (BP) later in life, most likely due to fetal under-nutrition. This study examines the relationships between adult systolic blood pressure (SBP) and diastolic blood pressure (DBP), birth weight, and maternal nutritional status and dietary intake during pregnancy. This study draws on a large sample (n=1632) of Filipino young adults aged 20-22 using data from the Cebu Longitudinal Health and Nutrition Survey (CLHNS), a community-based birth cohort study in Cebu City, Philippines begun in 1983. The baseline maternal survey was given at 30 ± 4 weeks gestation and the children were surveyed at birth and through childhood into adulthood. A series of linear regression models was used to examine the relationship between SBP and DBP to birth outcomes, maternal nutritional status during pregnancy as measured by triceps skin fold thickness, and dietary intake during pregnancy while controlling for socioeconomic status, age, height, BMI of the young adults, and other confounders. Birth weight was inversely related to SBP in males, and birth weight and length were inversely related to DBP in males. Maternal triceps skin fold thickness was inversely related to SBP and DBP in males and to DBP in females. Components of the mother's diet during pregnancy had varying relationships with the young adult BP of male and female offspring. Maternal nutritional status and dietary intake during pregnancy have implications for offspring's BP regulation later in life.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Introduction

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality worldwide. In the Philippines, CVD caused 27% of all deaths in 2002 (WHO 2005). The risk factors for CVD in adulthood have been widely studied. They include high blood pressure, smoking, lack of physical activity, age, and stress (National Heart Lung and Blood Institute, 2009). More recently, studies have been examining causes of CVD that emerge during early development. These studies attempt to explain whether an individual's susceptibility to chronic disease later in life can be "programmed" by early life experiences, specifically those *in utero*. It is hypothesized that the intrauterine nutritional environment affects fetal growth, which influences the expression of cardiovascular disease later in life. Thus far, study results have been inconsistent in that they have found direct, inverse, or no relationship between birth weight or birth length and CVD. Studies examining the relationships between maternal nutrition status during pregnancy, maternal dietary intake during pregnancy, and CVD in adulthood have not gathered consistent results either. Therefore, the programming of CVD is still debatable.

In this study, we use data from the Cebu Longitudinal Health and Nutrition Survey (CLHNS). We aim to examine the relationship between size at birth and systolic blood pressure (SBP) and diastolic blood pressure (DBP) in Filipino young adults, before and after taking into account maternal nutritional status and dietary intake during pregnancy, using BP as a measure of risk for CVD. This comprehensive, longitudinal data allows us to examine the long-term effects and relationships between health, culture, and behavior. Few studies have examined human maternal dietary intake during pregnancy and its effects on long-term health. Lastly, very few longitudinal studies have taken place in countries undergoing the nutrition transition, where changing dietary intake is changing the development of chronic disease. Using the CLHNS data,

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

we will test the hypothesis that birth weight, maternal dietary intake, and maternal nutritional status during pregnancy predict adult offspring blood pressure.

DOHaD

Developmental Origins of Health and Disease (DOHaD) is a model that explains how CVD and early life experiences, such as birth outcomes, maternal dietary intake and nutritional status during pregnancy, could be related. Much research has shown that early life events that determine susceptibility to disease in adulthood do not occur specifically *in utero* during the period of fetal development, but can also occur throughout the period of developmental plasticity. The word “developmental” rather than “fetal” encompasses both the fetal period and the period of infancy. Secondly, DOHaD incorporates ideas about disease, and also about health (Gluckman and Hanson, 2006). DOHaD can be used in public health and health education programs and presents a new way of thinking about how early life events affect adult health and disease.

Programming can be defined as the “permanent or long-term change to the physiology, morphology, or metabolism of a fetus in response to a specific insult or stimulus at a critical period in development” (Langley-Evans et al. 1998). Thus, events early in life, such as nutritional deficiency *in utero*, play a strong role in impacting susceptibility to the metabolic syndrome which leads to chronic, non-communicable diseases later in life including non insulin-dependent diabetes mellitus, coronary heart disease, and hypertension (Harding, 2001; Philips 1998; Barker and Martyn, 1992; Kuzawa 2004). For example, cardiovascular disease could be the outcome of short-term fetal physiological adjustments to under-nutrition that are crucial to survival, but have harmful effects in life post-reproduction (Godfrey and Barker 2001).

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Programming of tissues and organs occurs during a “critical period” during development when physiological changes can become fixed. During this time, fetuses are “plastic” and are subject to environmental influences (Godfrey and Barker 2001). The critical period occurs at various stages throughout embryonic and fetal development with different organs and tissues developing during different critical periods (Symonds et al. 2006).

Several ideas in relation to life history theory can explain the relationship between early life events and the development of disease in adulthood. These include the thrifty phenotype, predictive adaptive response, environmental mismatch, or developmental programming. All of these theories claim that fetuses receive signals from their environment, and adapt to their environment, which will help them better cope with environmental stressors later in life (Silveira et al. 2007). In particular, adapted fetuses will be better prepared to cope with the stressors that the mother encountered during her pregnancy about which the “signal” is conveyed to the fetus. However, if the postnatal environment differs from the predicted environment, the adaptation can actually be harmful and there is increased risk of disease. For example, low birth weight babies who are born into an affluent environment are at a higher risk for coronary heart disease, hypertension, and type 2 diabetes (Bateson et al. 2004). This possibly occurs because their bodies have been programmed metabolically for a low resource environment but they experience nutritional abundance.

Much animal model data and human epidemiological data support DOHaD, however, the exact biological mechanisms are not yet fully understood. Recently, epigenetic mechanisms to explain DOHaD have come into view. Epigenetics is the study of heritable changes in DNA caused by reasons other than alterations in the DNA sequence. These changes include histone modification, DNA methylation, and DNA-binding proteins. The epigenetic hypothesis for the

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

development of disease states that early environmental stressors and influences trigger epigenetic changes, which affect chronic disease risk. For example, DNA hypo- and hypermethylation has been implicated early in atherogenesis, the formation of plaques that leads to CVD (Waterland and Michels 2007).

Birth Weight and Maternal Nutrition and Diet During Pregnancy

Nutrition is a major programming stimulus and the mechanisms by which maternal under- or over-nutrition lead to low birth weight may contribute to understandings of DOHaD. Maternal under-nutrition could result from low intake of nutrients due to restricted food access or famine. Inadequate or improper maternal nutrition leads to intrauterine growth retardation (IUGR), which manifests as thinness and decreased birth length and weight, which lead to increased BP later in life. However, a distinction must be made between maternal nutrition and fetal nutrition, which is the total supply of metabolic substrates to the fetus (Harding 2001). According to Harding, fetal growth is at the end of a chain of events including maternal diet, maternal metabolic and endocrine status, placenta transport, umbilical blood flow, and finally fetal uptake. If the chain of events has a large margin of error, changes in maternal diet may not influence fetal growth strongly (Harding 2001). Hence, the fetus may be buffered from maternal environment.

Few studies have been conducted in humans using measures of maternal nutrition or maternal dietary intake to test the idea that nutrition is a programming stimulus. Animal studies have shown that decreasing protein intake during pregnancy leads to reduced birth weight and increased blood pressure later in life (Langley-Evans et al. 1998). Laura et al. used maternal anthropometric variables (pre-pregnancy weight and BMI) and weight at the end of the pregnancy as a measure of maternal nutrition to show that these variables have positive

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

associations with SBP and DBP in male and female adolescents in a developing country (Laura et al. 2010). Adair et al. found that higher SBP and DBP in adolescent boys are associated with low maternal fat stores at around 30 weeks gestation. Further, SBP in adolescent boys was inversely related to the percent of the mother's energy intake from protein during late gestation and SBP and DBP were inversely related to mother's percentage of energy intake from fat during pregnancy (Adair et al. 2001).

Birth Weight and Blood Pressure

Human studies on the relationship between birth weight and blood pressure have obtained varied results. A study of 49-year old Swedish men found that adult systolic blood pressure (SBP) was not correlated with birth weight (Siewert-Delle and Ljungman 1998). Another study comparing SBP to either full term or pre term birth weight at 2.5 years found the same result (Bracewell et al. 2007). Conversely, others have found an inverse relationship between birth weight and blood pressure (Davies et al. 2006; Gamborg et al. 2007), including research from the Guangzhou Biobank Cohort Study in a developing Chinese population (Schooling et al. 2010). Further, the Bogalusa Heart Study, a longitudinal study conducted on 16,000 adults and children in Bogalusa, Louisiana, showed that low birth weight was associated with higher SBP in adolescence, and that association was amplified with age from adolescence to adulthood, even after adjusting for race and BMI (Chen et al. 2010). On the other hand, other studies have found no association between birth weight and BP, especially when BP is measured in infancy (Hindmarsh et al. 2010) or in adolescence (Falkner et al. 2003). Thus, findings regarding relationships between birth weight and BP are inconsistent.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Nutrition Transition

This study sheds light on the relationships between health, nutrition and cultural factors. The nutrition transition refers to the range of sociocultural, demographic, as well as biological effects of globalization, which cause a shift in diet and physical activity patterns. In countries undergoing the nutrition transition, diet shifts towards a higher fat and meat content and reduced carbohydrate and fiber content. Physical activity shifts from labor intense agricultural activities to more manufacturing and service jobs, both of which are more sedentary (Popkin 1997). As a result of the transition, people are consuming more energy and activity is becoming idler. These shifts are appealing, but have detrimental effects on health.

The changes in diet and physical activity have caused the incidence and prevalence of obesity to increase, especially in middle- and low-income countries. In 2004, Adair found that in Cebu, the rate of overweight and obesity increased from 6% in 1983-1984 to 35% in 1998-1999, an approximately six-fold increase. This increase corresponds with economic changes exhibited by increased household income and ownership of consumer goods, a shift to foods higher in fat, a reduced burden of household work, and more sedentary jobs. The incidence and prevalence of obesity and overweight is highest in higher SES households, but is increasing in poorer households also.

Increases in income and assets affect diet and activity patterns. In Cebu, women learn skills to set up their own businesses, and one in seven women own their own "sari-sari" shops. The work is mostly sedentary and there is high access to snack foods. Work away from home is associated with higher weight gain in this population. Furthermore, income increases with increased work hours, and higher income is related to dietary changes, such as eating foods with higher fat content (Popkin 2003). Thus, this population is undergoing the nutrition transition.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

In Cebu, it was found that increasing socioeconomic status and urbanicity is directly associated with a more obesogenic diet. Urbanicity is rated on an “urbanicity index” and the most urban community would have the greatest population size and density, most communication, transportation, healthcare services, education and market availability (Kelles and Adair 2009). The resulting weight gain due to these changes in Cebu is associated with health consequences such as obesity and risk for hypertension (Popkin 2003). The health trend among Cebu women is consistent with the same trend in other developing countries where increasing obesity is significantly directly associated with BP (Adair 2004). Thus, this population is more likely to develop metabolic syndrome, the metabolic risk factors that predispose individuals to CVD and diabetes, than if globalization and the transition had not occurred.

The nutrition transition can take place in a single lifetime if the individual is born into a pre-westernized diet and physical activity pattern but shifts to a diet higher in fatty foods and low physical activity. When individuals go through the nutrition transition during their life, they are at an especially increased risk for noncommunicable chronic diseases (NCD's). Such individuals encounter a “dual burden”. They are underweight during infancy and childhood, but as they undergo the nutrition transition, they are at a higher risk of developing NCD's. The dual burden individuals are actually more likely to develop metabolic syndrome than those who have not undergone a transition, possibly due to DOHaD. The individual as a fetus and an infant adjusts to a “pre-westernized” diet and the changeover to a diet high in fat and processed or fast food distresses the body. It is common for under-nutrition and over-nutrition to coexist in populations experiencing the nutrition transition (Doak et al. 2005; Popkin 2009). Our findings support this idea that the impacts of cultural and dietary change, which are underway in the Philippines and

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

many similar places around the world, will be worse for individuals who began life with poorer nutrition. Thus, poor early nutrition can exacerbate the negative impacts of gaining weight later in life.

Materials and Methods

Survey Design and Sample

The data for this project come from the Cebu Longitudinal Health and Nutrition Survey (CLHNS), an ongoing, community-level survey that follows a cohort of 3080 women and their infants born between 1983 and 1984. All pregnant women were invited to participate in the surveys as long as they gave birth between that interval. The refusal rate was very low (<3%), and there are no data on those mothers who refused to participate. The women lived in 33 randomly selected communities in Metro Cebu, the second largest metropolitan area of the Philippines. The communities include urban neighborhoods and more isolated rural villages (Adair et al. 2001). The CLHNS data were collected from 1983 to 2007 and the data for this analysis come from data collected from mothers during their third trimester of pregnancy (30 ± 4 weeks in 1983-1984), from their offspring at birth (1983-1984), and from the 2005 survey, when the offspring were between 20 and 22 years of age. Complete blood pressure, anthropometric, environmental, and sociodemographic data were available for 1632 of the initial 3080 infants. Informed consent was obtained from all study participants and the use of human subjects was approved by the institutional review boards at Northwestern University and University of North Carolina.

Data Collection

At baseline, trained interviewers took mothers' anthropometric measures, and mothers were asked to complete a single 24-hour dietary recall. Triceps skin fold thickness and dietary

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

intakes of protein, fat, and total energy intake at about 30 weeks of gestation were used as measures of maternal nutritional status during pregnancy. The Philippines Food Composition Tables were used to calculate energy and nutrient intakes. The mother's percent of energy from protein, and total energy intake were used in the models. Percent of energy from fat and carbohydrates were not used in the models due to colinearity with the other measures of dietary intake.

Infant length at birth was measured less than 6 days after birth by trained staff with custom length boards. Infants born in hospitals were measured with hospital scales and birth attendants who were trained in the use of hanging Salter scales measured infants born at home. Gestational age was estimated from the mother's last menstrual period. Body mass index (BMI) was calculated to measure relative weight (Adair et al. 2001).

Anthropometric measurements of the young adults' weight and height, arm, hip, and waist circumferences, and triceps and subscapular skin folds were taken using standard anthropometric techniques (Lohman et al. 1988). The young adults were asked to do two 24-hour dietary recalls on consecutive days. The mean of the recalls was used in the analysis. The young adults' percent of energy from fat, and total energy intake were included in the models. Physical activity was not included in the models because it was not accurately measured. The young adults were asked if they currently smoked, and if they had smoked in the past. Systolic and diastolic blood pressure was measured three times for each individual using a mercury sphygmomanometer and the mean was used in the analysis. The mother's blood pressure in 2005 was measured by the same interviewer, but it was not measured at baseline. Socioeconomic status of the household was estimated by total deflated household income and the possession of household assets, such as air conditioning, or an electric fan. Socioeconomic

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

variables are not directly related to blood pressure, but affect it more indirectly through other factors such as nutritional status and diet (Adair et al. 2001). Individuals who were not included in this analysis due to missing data did not have significantly different measures of birth length, weight, and blood pressure than those that were included.

Analysis Methods

All analyses were conducted using version 10 of Stata. Here, we stratify our analyses on sex based on previous reports that fetal programming differentially affects male and female fetuses. The outcome variables, SBP and DBP, were treated as continuous variables by ordinary least-squares regression. Variables that were not normally distributed (mother's triceps skin fold thickness, adult offspring's current energy intake, and deflated household income) were log transformed to create a normal distribution. Offspring's sex, offspring's smoking, and mother's vitamin use were treated as nominal variables. Offspring's birth weight (kg), birth length (cm), and current age, height (cm), BMI (kg/m^2), energy intake (kcal), and percent of energy from fat were treated as continuous variables as were mother's triceps skin fold thickness (mm), height (cm), energy intake during pregnancy (kcal), and percent of energy from protein during pregnancy.

A correlation matrix was created to detect any relationships between the outcome and predictor variables (Tables 2 and 3). Upon inspecting the table, we see that SBP and DBP are positively correlated with offspring's adulthood height and BMI, as expected. Thus, during regression analysis, BMI and weight should be included as controls to better understand the relationship between birth weight and adulthood BP.

A series of regression models were created to elucidate the relationships between the outcome and predictor variables. In model one, the relationship between birth outcomes (birth

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

weight and birth length) and young adults' SBP and DBP were examined while controlling for adulthood age, height, and BMI. Model two adds maternal anthropometric variables during pregnancy (height and triceps skin fold thickness). Model three adds variables measuring maternal dietary intake during pregnancy (total energy intake, percent of energy from protein, and vitamin use). Model four adds variables measuring the young adult's current diet (total energy intake and percent of energy from fat). Model five adds the young adult's lifestyle variables and measures of socioeconomic status (smoking, household income, urbanicity, and assets). Model six adds the mother's current BP.

Results

Table 1 presents descriptive characteristics of the study participants. Compared to age-matched US men (McDowell et al. 2005), the Cebu young men in this sample were shorter (mean height: 162.95 cm vs. 176.0 cm in Cebu and US, respectively) and thinner (mean BMI: 20.99 kg/m² vs. 27.8 kg/m²). Compared to age-matched US women, the Cebu young women in this sample also were shorter (mean height: 151.17 cm vs. 162.10 cm) and thinner (mean BMI: 20.39 kg/m² vs. 28.20 kg/m²). In this sample, 97.05% of males and 97.17% of females had a BMI below the age- and sex-specific median of the US. A total of 11.33% of males and 13.76% of females reported smoking currently, and 8.85% of males and 10.83% of females were born at a low birth weight (<2.5 kg). Prepregnancy BMI data was not collected. The upper limit of a normal, healthy SBP is 120 mm Hg and 15.94% of males and 2.55% of females are above that limit. The upper limit of a normal, healthy DBP is 80 mm Hg and 24.79% of males and 5.48% of females are above that limit.

There were some significant univariate correlations between birth weight and SBP or DBP in males and females. Tables 2 and 3 present correlation matrices for modeled variables and

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

potential confounders. It is not uncommon for many variables to be intercorrelated. For example, income may be in the pathway of nutritional status as measured by triceps skin fold thickness and height, or BMI, which would cause correlations. Gestational age was taken out of the models because it had no significant main effect and did not modify the effects of birth weight or length. The adolescent's household socioeconomic status and lifestyle factors were not significantly associated with BP and did not change the relationship of the maternal or birth characteristics to BP.

Systolic BP

In males, there was a significant inverse relationship between birth weight and SBP after controlling for age, height, and BMI (Table 4, model 1). In males, lower birth weight predicts higher adulthood blood pressure. Furthermore, lower birth weight in combination with a higher adult BMI puts the individual at an even greater risk for elevated SBP in adulthood (Figure 1). SBP was significantly associated with age, height and BMI in males and with BMI and height in females. In females, there was no significant relationship between birth outcomes and SBP (Table 5, model 1). Mother's triceps skin fold thickness during pregnancy was significantly inversely related to SBP in males but mother's height did not affect the model (Table 4, model 2). The relationship between SBP and birth weight slightly lessened when variables of maternal nutritional status during pregnancy were added. Maternal anthropometric variables during pregnancy were not related to SBP in females (Table 4, model 2).

Relationships between maternal diet during pregnancy and SBP differed in males and females. In males, the mother's total energy intake was directly associated with SBP and the mother's percent of energy from protein was inversely related to SBP (Table 4, model 3). In females, the mother's percent of energy from protein was directly associated with SBP, and the

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

mother's vitamin use was inversely related to SBP (Table 5, model 3). When birth weight and birth length were removed from the models (not shown), the relationship of the mother's height and mother's skin fold thickness during pregnancy to SBP was approximately unchanged in males and females. Measures of the male's current diet were unrelated to SBP, but females' total energy intake currently was significantly associated with SBP (Table 5, model 4). As stated above, current lifestyle factors and socioeconomic status were not related to SBP (Tables 4 and 5, model 5). Mother's current SBP was significantly related to SBP in males and females (Tables 4 and 5, model 6).

Diastolic BP

In males there was a significant inverse relationship of birth weight and birth length to DBP after controlling for age, height, and BMI (Table 6, model 1). In males, lower birth weight predicts higher adulthood blood pressure. Furthermore, a lower birth weight in combination with a higher adult BMI puts the individual at an even greater risk for elevated DBP in adulthood (Figure 2). DBP was significantly associated with age and BMI in males and with BMI and height in females. In females, there was no significant relationship between birth outcomes and DBP (Table 7, model 1). In males and females, the mother's triceps skin fold thickness during pregnancy was significantly inversely related to DBP but mother's height did not affect the model (Table 6, model 2). In males, the relationship between DBP and birth weight slightly lessened when variables of maternal nutritional status during pregnancy were added (Table 6, model 2).

In males, there was no significant relationship between maternal diet during pregnancy and DBP or between the male's current diet and DBP (Table 6, models 3 and 4). In females, there was a significant association between the mother's percent of energy from protein during

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

pregnancy and DBP, and between the female's current total energy intake and DBP (Table 7, models 3 and 4). Lifestyle factors and socioeconomic status were not related to DBP in males or females (Tables 6 and 7, model 5). Mother's current DBP was significantly related to current DBP in males and females (Tables 6 and 7, model 6).

Discussion

We found an inverse relationship between birth weight and SBP and DBP in males and also between maternal nutritional status during pregnancy and SBP and DBP in males. The effects of the composition of the mother's diet during pregnancy varied between males and females. Also, the mother's current BP was positively associated with the adult offspring's BP. These results suggest that birth weight is a significant predictor for adulthood blood pressure and also provide some evidence for fetal programming of blood pressure.

Consistent with other human studies (Davies et al. 2006; Gamborg et al. 2007; Schooling et al. 2010) this analysis found an inverse relationship of birth weight to SBP in males and an inverse relationship of birth weight and birth length to DBP in males in a sample of 847 males. When birth weight was separated into quartiles and adjusted for confounders, the lowest quartile of birth weight predicted the highest SBP or DBP in adulthood (Figures 3 and 4), which is consistent with literature (Primatesta et al. 2005; Levitt et al. 1999).

After controlling for potential confounding factors, we found a strong inverse relationship between birth weight and SBP and DBP. This is a much more robust change in comparison to the change in a similar age group in the US (Huxley et al. 2002; Davies et al. 2006). This phenomenon is not well understood but could be due to differing components of dietary intake in pregnant mothers in Cebu versus the US or due to differential access to nutritious foods. An analysis similar to this one conducted on the same cohort of individuals when they were

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

adolescents also found an inverse relationship between birth weight and SBP, but the relationship is weaker than the one we report (Adair et al, 2001). Hence, the findings of this analysis suggest that the inverse relationship between birth weight and SBP is sustained from adolescence through adulthood and that the relationship between birth weight and BP amplifies with age.

Human studies examining maternal nutritional status during pregnancy are few. In a large study of Israeli youth, Laor et al. found that maternal anthropometric variables during pregnancy, including maternal BMI and weight gain, were not related to the offspring's BP at age 17 (Laor et al. 1997), but Godfrey et al found an inverse relationship between mother's triceps skin fold thickness and SBP in a sample of 10-12 year old Jamaican children (Godfrey et al. 1994). Similarly, the study done by Adair and Kuzawa on this same sample also found an inverse relationship between maternal fat stores and SBP and DBP in boys (Adair et al. 2001). Consistent with the Adair finding, this study also uncovered an inverse relationship between mother's triceps skin fold thickness to SBP in males, and to DBP in males and females. This suggests that maternal nutrition status is a fundamental programming stimulus.

As shown in animals through dietary restriction, poor maternal nutrition, which generates an unsatisfactory intrauterine environment, is a causal factor in programming and can lead to higher BP later in life. Animal studies have found that decreasing the amount of protein during pregnancy leads to reduced birth weight and increased blood pressure later in life (Langley-Evans 2001; Woods et al. 2001). Thus, maternal nutrition may be a prime programming stimulus. Our analysis included the mother's total energy intake and the percent of energy intake from protein in the diet during pregnancy. In males, SBP was directly related to the mother's total energy intake and inversely related to the mother's percent of energy intake from protein, which is consistent with the animal model above. In females, SBP and DBP were directly

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

related to the mother's percent of energy intake from protein, and the mother's vitamin use during pregnancy was inversely related to SBP.

A study by Shiell et al found that Scottish mothers who consumed a high meat, low carbohydrate diet during the second half of their pregnancies had offspring with elevated SBP at 27 to 30 years of age (Shiell et al. 2001). This is consistent with the findings of Campbell et al that a high protein, low carbohydrate diet led to higher SBP (Campbell et al, 1996). In this analysis, the relationships of females' SBP and DBP to protein are consistent with the Shiell and Campbell findings. However, Thone-Reineke et al. found that high maternal protein intake during pregnancy leads to higher SBP in boys, not girls (Thone-Reineke et al. 2006). Thus, human studies of the relationship between maternal protein intake and offspring are inconclusive. This issue would benefit from investigation of the mechanisms, rather than just epidemiological evaluation.

Maternal total energy intake during pregnancy was unrelated to SBP in females and to DBP in both females and males. This proposes that dietary composition may affect fetal programming more than total energy intake. Roseboom et al found similar results in a study of Dutch adults (Roseboom et al. 2001). Decrease in SBP was dependent on an increase in the protein to carbohydrate ratio during the mother's third trimester of pregnancy. Thus, the balance of macronutrient intake influences programming more strongly than total energy intake.

The finding that maternal vitamin use during pregnancy is inversely related to SBP in females could suggest that micronutrient composition of the mother's diet is also playing a role in fetal programming. However, this assumption is limited because since the measures of dietary intake are only based on one 24-hour recall, vitamin use is not a very strong indicator of frequency of use throughout the pregnancy. Furthermore, data about the micronutrient content

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

of the vitamins were not collected. The role of micronutrient composition of the mother's diet during pregnancy deserves further investigation, particularly because certain micronutrients have a place in the pathway towards cardiovascular disease.

The results of this analysis show that in females, current energy intake has a positive relationship with SBP and DBP. But in both instances, BP also has a positive relationship with the mother's percent of dietary intake from protein during pregnancy. Accordingly, there may be a complex relationship between current diet and fetal programming which compound to elevate blood pressure later in life. However, a closer examination of the beta coefficients from the linear regression analyses shows that female's current total energy intake is a stronger predictor of SBP than the mother's percent of energy intake from protein and it is also more significant (Table 5). When looking at the beta coefficients that predict DBP in females, the coefficient for the female's current total energy intake is still a stronger predictor, but is slightly less significant (Table 7). Thus, in females, current energy intake has a greater influence on BP than maternal dietary composition during pregnancy. This is consistent with the finding that in females, birth weight does not predict blood pressure, and overall, fetal programming is not seen in females in this population.

This study revealed distinct sex differences in the relationship between birth outcomes and BP in adulthood. Recently, studies at the molecular level have begun to uncover the mechanisms connecting birth weight and hypertension. Nephron number is linked to the expression of hypertension, and autopsies have shown that patients who had hypertension had fewer glomeruli in their kidneys. A reduction in nephron number can originate *in utero* due to an adverse uterine environment, and could cause hypertension later in life (Alexander 2006). Both animal and human studies have shown that males have a higher tendency towards decreased

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

renal function than females, likely due to the ratio of sex steroids. Androgens, such as testosterone, enhance the progression of renal injury, whereas estrogens are protective *in vivo* (Gilbert and Nijland 2008).

Clinical trials have examined sex differences in renal function and programmed hypertension. A study conducted on 20 to 30 year olds in Norway found that growth restriction *in utero*, high blood pressure, and low renal function were all positively significantly associated. Furthermore, the association was stronger and more consistent in males than in females (Hallan et al. 2008). This is only one mechanism by which hypertension is programmed on a sex-specific basis. Others include utero-placental insufficiency, maternal obesity, or maternal renal compromise (Gilbert and Nijland 2008; Grigore et al. 2008). Further research into these pathways would help elucidate the pathway to programming of disease.

Mother's current BP was found to be a significant predictor of the young adult's current BP, which could suggest some genetic factors influencing BP. It is widely accepted that genetic factors play a role in the pathogenesis of hypertension, and in this post-genome generation, some potential genes that cause hypertension have been identified, such as the angiotensinogen gene (AGT) and the angiotensin converting enzyme (ACE) gene (Dominiczak et al. 2004). However, environmental factors also influence an individual's susceptibility to hypertension so the positive relationship between the mother's BP and child's BP could be a result of mutual environmental factors that were not measured in this study.

The results from this study suggest opportunities for public health interventions. If the role of maternal macronutrient and micronutrient dietary composition during pregnancy and its effects on adulthood offspring BP were elucidated, preventative measures can be initiated in order to change the mother's diet during pregnancy. Moreover, this population lives in a

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

developing country going through the nutrition transition. Changes in diet and physical activity caused by the nutrition are seen in birth outcomes and measures of nutritional status. The results from this study show that birth outcomes and maternal nutritional status during pregnancy have consequences for BP regulation later in life. Appropriate public health interventions could reduce the burden of non-communicable chronic diseases.

Additionally, this analysis has found similar results as the study done on this same population when the subjects were adolescents (Adair et al. 2001). In that study, low maternal energy stores were inversely related to SBP and DBP in boys, parallel to the results of this analysis. Furthermore, the relationship between birth outcomes and BP in boys was also found in this analysis, but the relationship was intensified in comparison to the adolescent study. Examining amplification of the effects of fetal programming with age merits further investigation.

In conclusion, this study supports the hypothesis that maternal nutritional status during pregnancy influences the offspring's BP regulation in adulthood. Low birth weight and low maternal nutritional status during pregnancy were inversely related to SBP and DBP in males. The composition of the mother's diet during pregnancy affected the young adult's SBP and DBP differently in males and females, but is consistent with animal and human studies. The mechanisms of fetal programming in humans and the influence of macronutrient and micronutrient intake during pregnancy on hypertension warrant further study.

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Appendix

	Males n=847	Females n=785
Offspring		
Age	20.94 ± 0.33	20.93 ± 0.35
Height, cm	162.95 ± 5.89	151.17 ± 5.51
Weight, kg	55.85 ± 9.33	46.65 ± 8.00
BMI, kg/m ²	20.99 ± 3.04	20.39 ± 3.15
Birth weight, g	3.03 ± 0.42	2.98 ± 0.41
Birth length, cm	49.36 ± 2.03	48.88 ± 1.94
SBP, mmHg	112.08 ± 10.85	99.25 ± 10.06
DBP, mmHg	76.52 ± 9.29	67.88 ± 8.51
Mothers of Index children (all)		
During Pregnancy		
Height, cm		150.65 ± 5.01
Triceps skin fold thickness, mm		2.62 ± 0.34
Current		
DBP, mmHg		79.32 ± 13.02
SBP, mmHg		118.8 ± 20.32

Table 1. Descriptive statistics.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

	SBP	DBP	Birth Weight	Age	Height	BMI	Mother's Triceps	Mother's Height	Mother's kcal	Mother's % protein	Index Child's kcal	Inco me
SBP	1.00											
DBP	0.67*	1.00										
Birth Weight	0.03	0.03	1.00									
Age	0.02	0.00	0.05	1.00								
Height	0.09*	0.08*	0.30*	0.02	1.00							
BMI	0.34*	0.26*	0.11*	-0.03	-0.02	1.00						
Mother's Triceps	0.00	-0.02	0.21*	0.01	0.16*	0.12*	1.00					
Mother's Height	0.01	0.02	0.21*	-0.02	0.47*	-0.02	0.22*	1.00				
Mother's kcal	0.00	0.05	0.04	0.09*	0.12*	0.04	0.20	0.14*	1.00			
Mother's % protein	0.04	0.05	0.06	0.05	0.00	-0.03	0.10	0.03*	-0.05	1.00		
Index Child's kcal	0.05	0.07	0.08*	-0.01	0.14*	-0.04	0.08	0.13*	0.21*	0.01	1.00	
Income	-0.05	0.00	0.10*	0.03	0.11*	0.07*	0.16	0.08*	0.20*	0.01	0.11*	1.00

* $P \leq 0.05$

Table 2. Correlation matrix: females

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	SBP	DBP	Birth Weight	Age	Height	BMI	Mother's Triceps	Mother's Height	Mother's kcal
SBP	1								
DBP	0.60*	1							
Birth Weight	-0.02	-0.05	1						
Age	0.08*	0.05	-0.00	1					
Height	0.11*	0.003	0.22*	0.07*	1				
BMI	0.33*	0.29*	0.08*	-0.04	0.07*	1			
Mother's Triceps	0.00	0.00	0.15*	0.05	0.11*	0.21*	1		
Mother's Height	0.08*	0.04	0.17*	0.05	0.50*	0.11*	0.15*	1	
Mother's kcal	0.07*	0.06	0.04	-0.04*	0.13*	0.10*	0.22	0.13*	1
Mother's % protein	-0.09*	-0.03	-0.00	0.01	-0.01	0.06	0.03	-0.02	-0.04
Index Child's kcal	0.04	0.06	-0.00*	-0.08	0.11*	0.19*	0.14	0.09*	0.13*
Income	0.07*	0.08*	0.07	-0.01	0.11*	0.15*	0.19	0.09*	0.17*

*P≤0.05

Table 3. Correlation matrix: males.

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	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Birth						
Weight, kg	2.72 [`]	2.61 [`]	2.74 [`]	-2.82‡	-2.85‡	2.57 [`]
Length, cm	0.30	0.35	0.36	0.37	0.37	0.34
Adult Offspring's						
Age	2.79‡	2.94‡	3.11‡	3.02‡	3.12‡	3.31‡
Height, cm	0.14 [`]	0.13*	0.13*	0.14*	0.13*	0.13*
BMI, kg/m ²	1.18‡	1.24‡	1.28‡	1.29‡	1.27‡	1.26‡
Mother's During Pregnancy						
Triceps, mm		-3.01‡	-3.19‡	-3.09‡	-3.30‡	-3.64
Height, cm		0.04	0.03	0.04	0.03	0.03
Energy intake, kcal			0.0008*	0.0009*	0.0008	0.0009*
% energy from protein			-0.26‡	-0.26‡	-0.27‡	-0.28‡
Vitamin use			-1.13	-1.13	-1.23*	-1.11
Adult Offspring's						
Energy intake, kcal				-0.79		
% energy from fat				-0.002		
Smoking					-0.77	
Household income					0.55	
Assets					-0.06	
Urbanicity					-0.01	
Mother's						
Current SBP, mm Hg						0.05‡
Model R ²	0.126	0.133	0.146	0.157	0.1443	0.156

*p≤0.10

[`]p≤0.05

‡p≤0.01

Table 4. SBP in CLHNS Adult Males: β -Coefficients from Linear Regression Models

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Birth						
Weight, kg	-0.42	-0.24	-0.47	-0.60	-0.54	-0.59
Length, cm	-0.23	-0.21	-0.20	-0.19	-0.19	-0.21
Current						
Age	0.84	0.83	0.74	0.72	0.81	0.58
Height, cm	0.20‡	0.23‡	0.24‡	0.24‡	0.24‡	0.24‡
BMI, kg/m ²	1.08‡	1.10‡	1.10‡	1.10‡	1.10‡	1.11‡
Mother's						
Triceps, mm		-1.55	-1.42	-1.35	-1.29	-1.62
Height, cm		-0.03‡	-0.04	-0.05	-0.04	-0.05
Energy intake, kcal			0.00004	-0.0001	-0.00004	-0.00009
% energy from protein			0.15*	0.15*	0.17 [^]	0.13*
Vitamin use			1.63 [^]	1.74 [^]	1.64 [^]	1.74 [^]
Index Child						
Energy intake, kcal				1.69 [^]	1.64 [^]	1.43 [^]
% energy from fat				-0.02		
Smoking					0.21	
Household income					0.06	
Assets					-0.31	
Urbanicity					0.006	
Mother's						
Current SBP, mm Hg						0.03‡
Model R ²	0.124	0.127	0.126	0.142	0.145	0.149

*P≤0.10

[^]P≤0.05

‡P≤0.01

Table 5. SBP in CLHNS Adult Females: β -Coefficients from Linear Regression Models

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	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Birth						
Weight, kg	-2.50‡	-2.48‡	2.41 [^]	2.41 [^]	2.40 [^]	2.60 [^]
Length, cm	0.33*	0.37*	0.34*	0.34*	0.35*	0.35
Current						
Age	1.63*	1.70*	1.80 [^]	1.82 [^]	1.91 [^]	3.25‡
Height, cm	-0.03	-0.05	-0.06	-0.06	-0.07	0.13*
BMI, kg/m ²	0.90‡	0.93‡	0.93‡	0.92‡	0.91‡	1.27‡
Mother's						
Triceps, mm		-1.57*	-1.78*	-1.87*	2.18 [^]	-3.42‡
Height, cm		0.05	0.04	0.04	0.04	0.03
Energy intake, kcal			0.0006	0.0006	0.0004	0.0009*
% energy from protein			-0.11	-0.11	-0.13*	-0.27‡
Vitamin use			-0.07	-0.11	-0.29	-1.19
Index Child						
Energy intake, kcal				0.03		
% energy from fat				0.01		
Smoking					0.21	
Household income					0.30	
Assets					0.23	
Urbanicity					0.01	
Mother's						
Current SBP, mm Hg						0.64 [^]
Model R ²	0.095	0.099	0.103	0.104	0.108	0.151

*P≤0.10

[^]P≤0.05

‡P≤0.01

Table 6. DBP in CLHNS Adult Males: β -Coefficients from Linear Regression Models

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	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Birth						
Weight, kg	0.03	0.21	0.23	0.14	0.10	0.14
Length, cm	-0.19	-0.17	-0.20	-0.19	-0.19	-0.20
Current						
Age	0.20	0.21	0.25	0.25	0.11	0.13
Height, cm	0.15‡	0.16‡	0.16‡	0.15 [~]	0.15 [~]	0.16‡
BMI, kg/m ²	0.71‡	0.74‡	0.74‡	0.75‡	0.76‡	0.75‡
Mother's						
Triceps, mm		-1.69*	2.10 [^]	2.11 [^]	2.01 [^]	2.25 [^]
Height, cm		-0.01	-0.01	-0.02	-0.03	-0.34
Energy intake, kcal			0.0006	0.0004	0.0004	0.0004
% energy from protein			0.15 [~]	0.15 [~]	0.16 [~]	0.14 [~]
Vitamin use			-0.07	-0.19	-0.15	-0.13
Index Child						
Energy intake, kcal				1.10*	1.20*	1.16*
% energy from fat				0.004		
Smoking					0.44	
Household income					0.22	
Assets					-0.0002	
Urbanicity					-0.01	
Mother's						
Current SBP, mm Hg						0.04 [^]
Model R ²	0.078	0.083	0.091	0.081	0.096	0.101

*P≤0.10

[~]P≤0.05

‡P≤0.01

Table 7. DBP in CLHNS Adult Females: β -Coefficients from Linear Regression Models

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

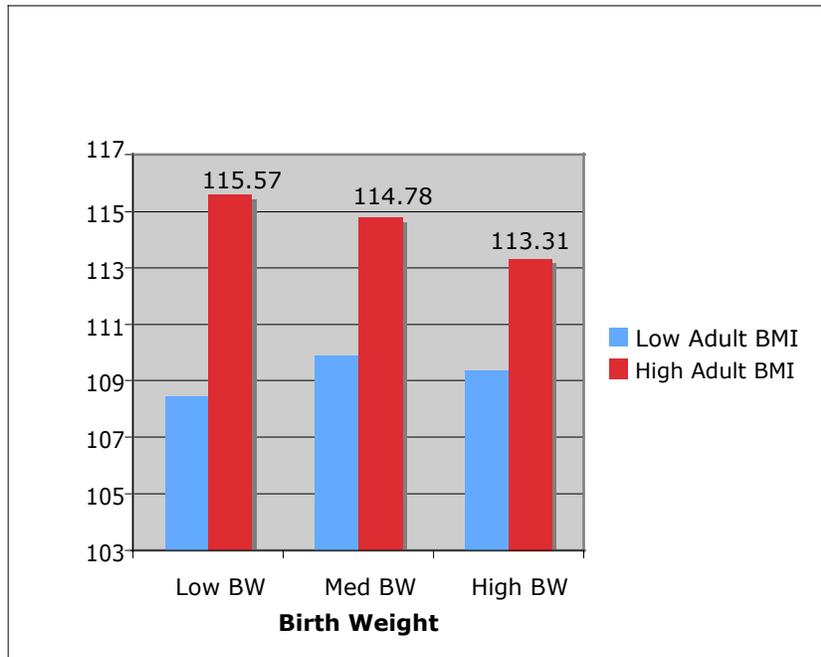


Figure 1. SBP vs. Birth Weight and Adult BMI in Males

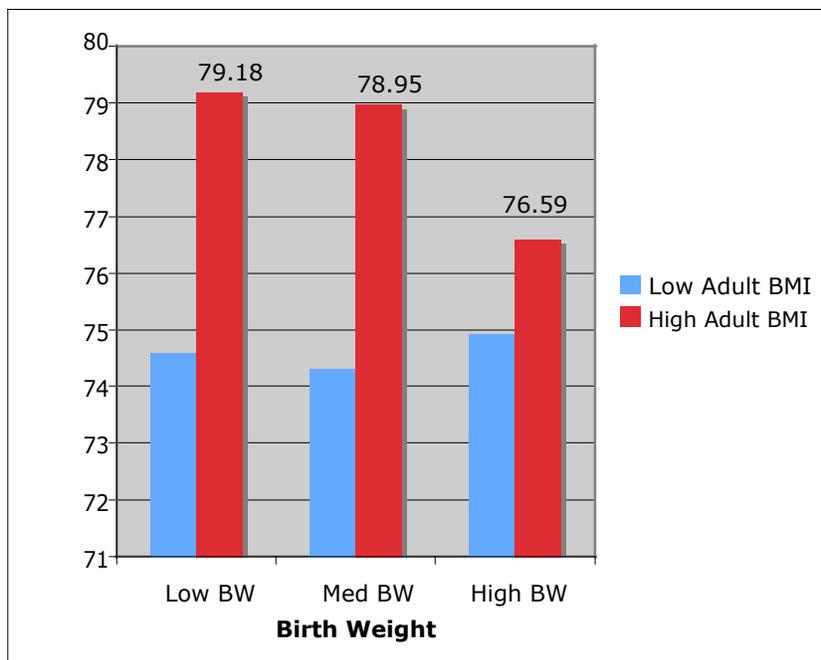


Figure 2. DBP vs. Birth Weight and Adult BMI in Males

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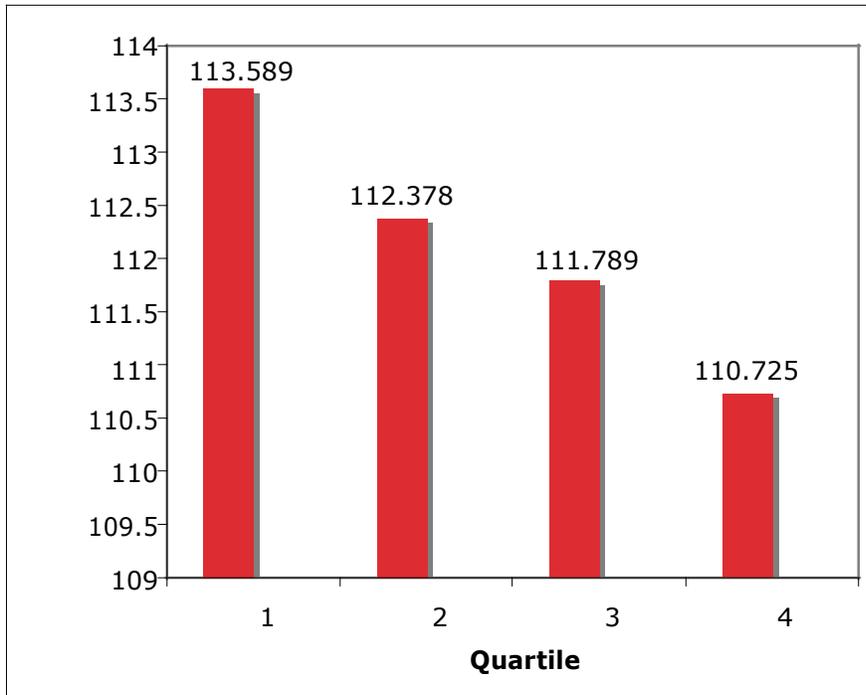


Figure 3. SBP vs. Quartiles of Birth Weight in Adult Males

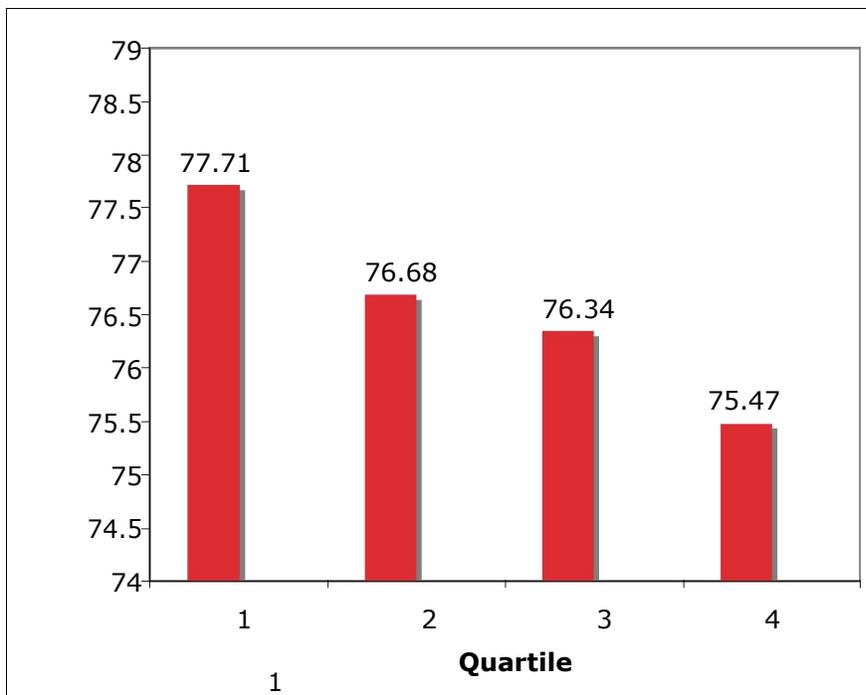


Figure 4. DBP vs. Quartiles of Birth Weight in Adult Males

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY



SCENE AT THE LUXEMBOURG GARDENS, PARIS, BY JACKSON KRULE

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TOOTH LOSS POSITIVELY PREDICTS CARDIOVASCULAR DISEASE
RISK IN ADULT FILIPINO WOMEN

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Abstract

Cardiovascular disease (CVD) is a growing global epidemic. Recent studies have shown that CVD is negatively associated with oral health, likely reflecting the propensity of oral fauna to cause systemic inflammation, which in turn thickens the arterial walls. As globalization increases, populations in some developing countries adopt dietary and activity patterns that increase the risk of CVD while retaining poor oral hygiene habits, the main factor in high rates of tooth loss. This study's primary objective was to investigate the association between tooth loss and CVD controlling for relevant covariates related to lifestyle, and to evaluate the possible mediating role of C-reactive protein (CRP), an inflammatory marker. Measures of tooth loss, anthropometry, disease history, pathogen exposure, income, and urbanicity ranking were evaluated as predictors of CVD in 1,619 women participating in the Cebu Longitudinal Health and Nutrition Survey in the Philippines. A series of maximum likelihood logistic regression models were used to predict CVD risk in women who developed CVD after age 20. Extreme tooth loss, defined as greater than 25 teeth missing, was the strongest predictor of elevated CVD risk [OR= 2.11; $p < 0.018$]. Two candidate pathways were considered, a) inflammation, which is caused by bacteria entering the bloodstream from oral lesions; b) obesity, which may occur due to edentulous individuals eating softer, higher caloric foods. First, waist circumference, a measure of obesity, was tested as a possible mediator but did not appear to be a significant predictor of CVD. Next, when CRP was taken into account, the association between tooth loss and CVD became stronger and more significant [OR= 2.17; $p < 0.015$]. Nonetheless, tooth loss

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

was not predictive of CRP, and CRP was positively, but not significantly, associated with CVD risk. These results underscore the need for additional research on the potential mediating role of inflammatory markers to determine how tooth loss is associated with elevated CVD risk in the Philippines.

Introduction

Cardiovascular disease (CVD) is characterized by any of a number of specific diseases that affect the heart and/or the blood vessel system. The veins and arteries leading to and from the heart are especially vulnerable to the buildup of fatty substances in the arteries, a condition called atherosclerosis. Extra strain on the heart from atherosclerosis may result in chest pain, angina pectoris, and other symptoms. When one or more of the coronary arteries are completely blocked, a heart attack, or myocardial infarction, may occur (Mayo Clinic 2010). Poor oral hygiene and inflammation have been shown to correspond to CVD risk. This study aims to investigate this hypothesis in middle-aged Filipino women.

CVD has become a common cause of morbidity and mortality in most countries around the world. However, the incidence of disease is not uniform on a global scale. In industrialized countries, there has been a recent decline of CVD, which has been well documented (Thom 1989; Reddy and Yusuf 1998). In the United States, Canada and France, for example, CVD-related mortality fell by approximately 50% from 1965 to 1990 (Lopez 1993). The rate of CVD increase is greater in many developing countries than developed countries due to the modern epidemiological transition, a phenomenon in which a decline in deaths from infectious disease juxtaposes an increase in deaths from chronic disease (Yusuf et al. 2001). The epidemiological transition continues because of the rise in life expectancy. In the Asia-Pacific region, mortality attributed to CVD has increased nearly 300% from 1957 to 1990 (Khor 2001). Increasing longevity provides longer periods of exposure to the risk factors of CVD, including obesity,

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

tobacco, high blood pressure, diets high in saturated fat and a sedentary life-style (Howson et al. 1998). The Philippines is one country which faces a paradigm of both chronic and infectious disease. During the 1980s, CVD entered the Philippines' top ten list of causes of morbidity. Today, it is number seven on the list, behind respiratory tract infections, bronchitis, influenza, and diarrhea (Philippines Department of Health).

Both factors of diet and infection can impact the prevalence of CVD. Fats in the diet can contribute to high cholesterol and atherosclerosis while sugars contribute to the formation of dental caries. In South Asian countries, diet of rice, fruit, and fish has been replaced in part or supplemented by sugar and starch-containing foods and confections. Drewnowski and Popkin report that between 1962 and 1994, there was a major shift in the global diet that caused the classic relationship between income and fat intake to decouple. Greater fat consumption in low-income countries has arisen from the global availability of cheap vegetable oils and fats. Thus the nutrition transition now occurs at lower socioeconomic levels than it did previously, fueled by the evolutionarily-derived human preference for fats and sugars in the diet (Drewnowski and Popkin 2009).

Although economic development may have led to higher quality of life and better health for part of the population, the adverse health effects include the greater incidence of overweight and obese individuals as a result of an overall increase in total energy intake in developing countries undergoing urbanization (Popkin 1994). A study based on data from the Cebu Longitudinal Health and Nutrition Survey (CLHNS) found that the prevalence of overweight increased significantly among mothers and a cohort of their offspring between 1994 and 2005 (Kelles and Adair 2009). This period also coincided with rapid urban inflight and the migration of worker to cities (Quisumbing and McNiven 2005). Although under-nutrition is generally declining while over-nutrition is increasing, many Asian countries have the challenge of dealing

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

with a double burden of nutritional diseases (Mendez et al. 2005). As a typical example in the region, the Philippines followed predicted trends associated with demographic changes, economic development and the nutrition transition. Dietary macronutrient composition in the city of Manila has been increasing in fat content, animal products and sugars while decreasing in fiber, vegetables and fruits (Florentino et al. 1992). Here, the term “fat(s)” refers to both saturated and unsaturated lipids, and “sugars” refers to all monosaccharides and disaccharides. One influence on diet choice is the availability of food items. The number of fast-food restaurants is rising as well as processed foods on store shelves. In addition, non-hunger based motivations for eating provides an important influence on diet. These motivations include environmental, social, and emotional cues. A 2006 study of women in Bacalod and Manila, the Philippines, showed that urban females were significantly more likely than their rural counterparts to eat due to emotional and environmental reasons (Hawks et al. 2006). As unhealthy fast foods become more accessible physically and economically, the Philippines will likely experience an escalation in problems with overweight and obesity as well as downstream effects such as CVD.

The shift in diet towards more fat and sugar content has brought a large portion of the population into greater risk for tooth decay. There is a wealth of evidence from human studies and animal experiments that show the role of dietary sugars in the etiology of dental caries (WHO 2003). Not only do sugars promote dental caries and eventually tooth loss, but also people with poor oral health tend to eat softer, high caloric and sugar-filled foods, which in turn promotes further oral health and cardiovascular health issues. With the Filipino urban population increasing more than two million people each year (Bridges 2007), the nutrition transition has the potential to drastically change the relationship between people and their environment for large populations.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Another factor that influences the burden of CVD is the environmental level of pathogens. There are no direct measures of pathogen levels in the Philippines, but general practices suggest that pathogenicity is significantly greater compared to more economically advanced countries. In urban areas, untreated discharges of industrial and municipal wastewater result in extremely poor water quality. Untreated effluent is indiscriminately disposed of in the Pasig River, which is one of the world's most polluted rivers. Furthermore, less than 4% of the population of Manila, the capital city of the Philippines, is connected to the sewer network (Bridges 2007). In rural areas, pathogenicity results from farmyard animals that enter the house, water taken directly from the source without treatment, and the haphazard disposal of human waste since toilets are rare. In 1991, 25.1 percent of households did not have access to basic sanitation. This number rose to 30.6 percent in 1998 (United Nations 2004). Outbreaks such as diarrhea and cholera are not uncommon in the Philippines due to the lack of access to basic water services. The continuous presence of infectious disease agents and microbial contaminants can induce chronic inflammation, which has consequences on long-term health. Chronic inflammation can occur due to autoimmune diseases, frequent bouts of diarrhea or constipation, arthritis, heartburn, cancer, hypertension, hyperglycemia as well as cigarette smoking and pro-inflammatory foods (Gan et al. 2004).

Inflammation is a biological response elicited by the body in response to both acute and chronic physiological states. A marker of inflammation is c-reactive protein, or CRP, which is a protein produced by the liver in response to infection. As a marker, CRP can be measured to determine the current extent of infection. Elevated CRP levels for long periods of time occur as a result of chronic low-grade inflammation (Sun et al. 2005). Inflammation has been recognized as a risk factor for atherogenesis and thromboembolic events by triggering endothelial injury and inducing plaque formation on the arterial walls (Mehra et al. 2005). In doing so, inflammatory

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

molecules can infiltrate the lining of major blood vessels, causing vascular fatty degeneration and intravascular coagulation (Beck et al. 2000). In this way, inflammatory molecules contribute to atherosclerotic lesions and plaques, according to a statement by the American Heart Association (Pearson et al. 2003). In fact, virtually every step in atherogenesis is believed to involve immune-regulating cytokines and cells, such as macrophages, that are involved in the body's inflammatory response (Desvarieux et al. 2004). As a sensitive systemic inflammatory marker, CRP has been shown to predict cardiovascular events among middle-aged and elderly subjects through the inflammatory pathways outlined above (Tracy et al. 1997; Vasović et al. 2010). In 2008, a clinical trial called the JUPITER study, or "Justification for the Use of Statins in Prevention: an Intervention Trial Evaluating Rosuvastatin," announced that CRP predicted heart events independent of cholesterol levels. The results of the study, which had 17,802 participants, suggested that CRP is a promising predictive test for the likelihood of myocardial infarction, half of which occur in people with normal plasma lipid levels (Ridker et al. 2008; Michos and Blumenthal 2009). Thus CRP may be a valuable predictor of cardiovascular risk, even for individuals with no other major risk factor.

Oral infections are a common source of chronic inflammation. Infection of the oral cavity can cause a dentate person, defined in this study as one who possesses all natural teeth not including third molars, to lose teeth and eventually become edentulous, the condition of possessing no natural teeth. The infections are initiated by invasive gram-negative bacteria that colonize dental plaque biofilms on the root surface of the tooth. Infections that affect the periodontal tissues supporting the tooth - including the alveolar bone, periodontal ligament, cementum, and gingiva - are periodontitis and gingivitis, both considered forms of periodontal disease (Armitage 1999). Studies show that periodontal disease is a progressive disease that can last many years (Lang et al. 1986) and tends to change the ratio of harmless and harmful

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

bacterial fauna in the mouth (Närhi et al. 1993; Närhi et al. 1998; Loesche et al. 1995).

Previous research has found that oral bacteria can travel through the bloodstream from the oral cavity to other areas of the body including the heart (Khodaii et al. 2010; Desvarieux et al. 2005). While the bacterium stimulates a systemic inflammatory response, it can also trigger local inflammation in cardiac tissues and blood vessels. Thus inflammation in response to bacterial infection can cause great damage to the cardiovascular system.

Increasing problems with oral hygiene in the Philippines are augmented by poor health care infrastructure and lack of compliance with modern oral standards. The national prevalence for permanent as well as deciduous dental caries, or cavities, is 97.5% in rural areas and 96.7% in urban areas. In terms of DMFT (Decayed, Missing, Filled Teeth) Index, the Philippines ranked the highest amongst 17 countries according to the Global Oral Health Data Bank (WHO 2003). In a 1998 survey with the members of the Philippine Dental Association, 88.4 percent of dental practices were based in an urban area, 10.9 percent were in suburban centers while 0.7 percent were in a rural area. Furthermore, there was a 30.2 percent increase in the prevalence of periodontal disease from 1992 to 1998 (Philippines Department of Health 2005). It is possible that some of this increase is attributed to better reporting and diagnosis of oral health in the 1998 survey. From 1998 to 2005, no additional surveys were taken. Despite this information, we can infer from data of dental caries and periodontal disease that usage of toothbrushes, floss, and fluoride toothpaste was not high. The Filipino government itself has recognized this fact which led to the 2003 National Policy on Oral Health statement and forth-following programs (Philippines Department of Health 2003). According to a 1994 WHO survey, brushing instruction and mouth rinsing only covered 30 percent of the population (Deong 1994). Traditionally, the twigs of guava trees were used as rudimentary toothbrushes. Another method was to use one's finger as the toothbrush with sand as toothpaste (Severino 2005). The

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

effectiveness and continuation of these methods have not been studied, although they may be limited to rural areas or an impoverished demographic. In addition, a 2004 report, approximately 8 percent of the Filipino population is served by fluoridated water, considering both natural and artificially-enhanced water sources (The British Fluoridation Society 2004). The combination of poor oral healthcare and dietary habits points to downstream consequences such as cardiovascular disease.

The relationship between oral health and CVD has been a subject of mounting research (Mustapha et al. 2007; Desvarieux 2001; Nikawa et al. 1998). Studies on transient bacteremia and elevated inflammatory markers (Ebersole et al. 1997) show that poor oral hygiene in the form of a long-term infection can result in chronically elevated levels of CRP, which has a significant impact on the vascular system and cardiovascular health. However, the nature of the relationship between oral health, CRP, and cardiovascular health has yet to be determined. Investigating the association between tooth loss and biological, social, and demographic factors can help in the development of targeted and effective interventions for at-risk populations in a context where CVD is becoming an increasing public health concern.

The CLHNS is a longitudinal birth cohort study where women around the rural and urban Cebu metropolitan area were enrolled while pregnant. The present research focuses on these women, who are representative of the population from which they were drawn, twenty-two years later at ages 35 to 69 years ($n = 1,691$). This study was designed as a first attempt at evaluating predictors of heart disease in the original mothers of the CLHNS study, and it aims to explore the value of tooth loss for predicting heart disease by evaluating whether a woman's socioeconomic status, anthropometry, other diseases, and environment are confounding factors for the relationship between tooth loss, inflammation, and CVD risk. The Filipino sample of aging women offers diverse social, biological, and demographic variables with which to explore this

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relationship while adjusting for potential confounding influences; more detailed future analysis is planned.

Materials and Methods

Study Population

The Cebu Longitudinal Health and Nutrition Survey is an ongoing study of a cohort of Filipino women who gave birth between May 1, 1983, and April 30, 1984 conducted by the University of North Carolina, the University of San Carlos, the Nutrition Center of the Philippines, Johns Hopkins University, and Northwestern University. The *CLHNS* initially *recruited* all pregnant women in 33 randomly selected urban and rural communities, or barangays, of Metro Cebu through a single stage cluster sampling procedure. The barangays, which contained about 28,000 households, were completely surveyed by researchers in late 1982 and again in early 1983 to locate all pregnant women. Women of the selected barangays who gave birth between May 1, 1983, and April 30, 1984, are included in the sample. A baseline interview was conducted among 3,327 women, with subsequent surveys at intervals of several years until 2010. Each survey collects detailed health, nutrition, demographic, and socioeconomic data across individual, household, and community levels (UNC Carolina Population Center 2010).

Data Collection

The women have been followed through multiple rounds of data collection since 1983. Data were collected during interviews conducted in the respondents' homes. All data were obtained under conditions of informed consent and with human subjects clearance from the University of North Carolina, Chapel Hill, and the University of San Carlos. The data for the present analyses come from the most recently completed survey, conducted in 2005, when the women were 35–69 years old. Complete anthropometric, environmental, socio-demographic, and

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CRP data were available for 1,619 women. Participants provided information on household demographics and income levels, economic activities and resources, environmental quality, and health behaviors in personal interviews conducted in their homes. After an overnight fast, blood samples were taken, and plasma was stored for the analysis of cardiovascular disease risk factors. All data were collected under conditions of informed consent with institutional review board approval from the University of North Carolina, Chapel Hill.

Body weight, height, waist and hip circumference, and triceps, subscapular, and supra-iliac skin fold thickness were measured using standard anthropometric techniques (Lohman et al. 1988). The BMI was calculated as the ratio of weight (kg) to height (m^2). Oral health statistics such as number of teeth removed, toothache, and use of dentures were assessed during the interviews. Disease prevalence was verbally reported by the subjects during house visits. Heart disease was assessed with a yes/no question of whether the individual had the condition since 2002. If the response was positive, year of onset was also obtained.

CRP analysis

Venipuncture blood samples were collected using EDTA-coated vacutainer tubes in the participants' homes in the morning after an overnight fast. Blood samples were kept in coolers on ice packs for no more than 2 hours and were then centrifuged to separate plasma prior to freezing at -70°C . Samples were express-shipped in a single batch to Northwestern University on dry ice and stored frozen at -80°C until analysis. CRP concentrations have been shown to remain stable under these transport and storage conditions. CRP concentrations were determined using a high sensitivity immunoturbidimetric method (Synchron LX20, lower detection limit: 0.1 mg/L).

Statistical Analysis

Analyses proceeded in three stages, consisting of logistic regression models. First, tooth loss was considered as a predictor of heart disease. Second, models were adjusted for additional

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

factors known to influence heart disease and confound any association with tooth loss (age, anthropometry, hypertension, diabetes, and smoking). Measures of income, urbanicity, smoking, and chronic diseases were considered to account for omitted variables related to lifestyle and/or environmental quality that might confound associations between tooth loss and the prevalence of CVD. Third, the mediating effect of CRP was investigated by determining its effect on the relationship between tooth loss and CVD. In addition, the existence of an association between tooth loss and CRP and between CRP and CVD was investigated.

Urbanicity was converted into a dichotomous variable: more urban or less urban. Age was changed from months into years. Income and CRP were log-transformed to normalize the distributions. CRP was further divided into a 4-stage ordinal variable with levels 0-1.5, $1.5 < x < 3$, $3 - 10$, and > 10 mg/L. These cut-off values were selected based on recommendations issued by a joint scientific statement from the AHA and the CDC (Martin-Du Pan and Despont 2002; LabCorp 2001; Pearson et al. 2003). Concentrations of CRP >1.5 mg/L but <3 mg/L indicate average to moderately increased cardiovascular risk due to chronic, low-grade inflammation. CRP >10 mg/L are presumed to be the result of acute inflammatory processes (e.g. infectious disease), although recent research has suggested that CRP concentrations >10 mg/L are also predictive of cardiovascular risk. All statistical analyses were conducted with Stata for Windows, version 10 (StataCorp, College Station, TX). Criteria was $p < 0.05$ for significance. Values in the text are means \pm SEM or odds ratio (OR), 95% CI.

Measures of lifestyle factors were significantly associated with tooth loss, including household income, household hygiene, household assets, waist circumference, and age (see Table 2). In addition, several lifestyle factors were positively associated with CRP, including urbanicity, waist circumference, and age. As expected, hypertension was strongly associated with diabetes ($T = -5.22$, $p < 0.001$). Thirteen women, or 5.2% of the sample, had onset of heart

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

disease before age 20, so they were excluded from the analysis since, as expected, tooth loss (OR 0.89, $p < 0.851$, OR 0.52, $p < 0.55$) did not predict heart disease for this population. Hypertension, smoking, height, waist circumference, and living in an urban environment were not significantly related to this group. However, diabetes (OR 5.13, $p < 0.039$) and CRP > 10 mg/L (OR 9.52, $p < 0.053$) were strongly correlated, although they could have arisen later in life. The question of whether childhood onset of CVD is predictive of these variables is left to future studies. We used correlation analysis to test if the variables included in the model were inter-correlated.

Heart disease was a dichotomous variable (yes or no) that when cross-analyzed with year of onset of heart disease, showed that the majority of subjects (84%) reported onset at less than 50 years of age. To remove individuals with congenital or rheumatic heart disease, all children were omitted, defined as those who reported heart disease under age 20. These individuals would have experienced a minimal impact from tooth loss.

Results

Characteristics of study participants are reported in Table 1. Compared with US women of similar age (McDowell et al. 2008), the Cebu women in this sample were shorter (mean: 150.6 cm vs. 162.1 cm in Cebu and US, respectively), thinner (mean BMI: 24.3 kg/m^2 vs. 28.2 kg/m^2), and had a smaller waist circumference (mean: 81.2 vs. 92.7 cm) but a higher prevalence of smoking (16.3% vs. 10.2%) (Martin et al. 2006).

Analyses and models were restricted to the subsample of women for whom all variables were available ($n = 1,619$). Data on their male spouses were not complete. Individuals were excluded from the analyses due to missing data ($n = 399$) while others were lost to follow-up ($n = 1,309$). The excluded group did not differ from the analysis subsample with respect to baseline data on reports of age, height, BMI, tooth loss or illness, but had higher income (312.96 vs. 261.37 pesos/week) and were more likely to be smokers (19.75% vs. 16.16%). In addition they

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

had less formal education (0.86 ± 0.13 y) and lived in slightly more rural communities (3.65 ± 0.43 points on urbanicity scale). An unpaired t-test for these variables showed $p > 0.05$.

The predictive value of tooth loss for heart disease risk was evaluated using a series of logistic regression models that progressively added variables to evaluate possible sources of confounding and mechanisms of effect (Table 3). A statistical trend between the number of teeth lost and CVD was found in a bivariate regression (Model 1). Results show that the most extreme level of tooth loss (>25 teeth missing) predicted a significant increase in CVD risk while the other levels were not significant and showed a more modest CVD risk increment (Table 3).

Anthropometry was added to the model to determine the extent that age, height and waist circumference affected the primary association between tooth loss and CVD risk (Model 2). The odds ratios of the first two tooth loss levels did not change much but the third and most extreme level increased and became more significant. Next, controlling for income and urbanicity were not consistently related to heart disease. The variables did not have a large influence on the odds ratios of tooth loss levels. Next, accounting for smoking, hygiene, hypertension, and diabetes (Model 3) caused a large increase in the significance and odds ratio of the third level of tooth loss. Smoking was not a significant predictor of CVD, but hygiene showed a strong and significant association. As expected according to previous studies on the associations between hypertension, diabetes and CVD (Curb et al. 1996; American Heart Association 1994; Sowers et al. 2001), the odds ratios for disease conditions were both large and significant.

In Model 5, we examined the influence of CRP on the relationship between tooth loss and CVD as well as the association between CRP and heart disease (Table 3), using four levels of CRP as predictors of CVD. Overall, the first two levels of tooth loss did not change greatly, but the odds ratio of the third level increased and remained significant. The change indicates that CRP is a confounding variable with a possible masking influence. Individuals with more teeth

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

removed had lower CRP levels, seemingly putting them at lower CVD risk. Only the first level of CRP predicted CVD risk in a significant manner. The third level of CRP showed the largest OR and was not far from significance compared to the second level.

In the next series of models, the likelihood of tooth loss as a predictor of CRP was investigated (Table 4), considering the same predictors that were controlled for in the first series. In Model 1, tooth loss did not appear to be a significant predictor of CRP. For the third level of tooth loss, the OR was less than 1.00, which would invert the interpretation of the relationship if it was significant. Levels of tooth loss as predictors of CRP did not vary largely when age, anthropometry, sociodemographic factors, lifestyle factors, and diseases were accounted for. Age and waist circumference showed a positive, significant association with CRP, which suggests that a chronic inflammatory response is naturally induced by aging and increased adiposity levels. Linear regression shows that as women age, more teeth are removed ($r = 0.35$, $p < 0.001$), which may also influence CRP levels. Height showed a significant, inverse relationship, so that as height decreases, CRP levels increase. This may be related to adiposity and waist circumference as well. Living in a more urban environment shows a strong positive relationship with CRP that is significant. The other variables controlled for in the models were not significant.

Discussion

Infections associated with tooth loss are an example of both acute and chronic degenerative diseases that can lead to long term damage to other parts of the body. Women with most or all of their teeth missing experienced greater risk for CVD compared to those with less tooth loss or who were dentate. A resulting increase in CVD risk occurred with each level of tooth loss. Because the levels of losing 5-7 teeth and 8-16 were not significant and not as strong predictors as the odds ratio for the most extreme level, the results suggest that tooth loss is an

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

indirect predictor of CVD that is influenced by many other factors. Nevertheless, this relationship existed despite removing variables such as anthropometry, diseases, smoking, and lifestyle factors. In fact, accounting for these variables made the odds ratios for tooth loss more predictive of CVD risk and more significant.

In Cebu, sociodemographic factors including amount of income and living in an urban environment were not significant predictors of CVD. This is likely due to opposing influences that as quality of life and urbanization increases, higher levels of obesity can be expected to promote CVD while better healthcare access can help prevent and treat CVD. These results confirm that Cebu is an advantageous setting without biased distribution of individuals with CVD. In contrast, studies in more affluent settings found CVD concentrated in the higher socioeconomic strata (Yadav et al. 2008; Winkleby et al. 1992). Another advantage is that the Cebu population represents individuals experiencing a health transition. Tooth loss, as a residual condition of poor nutrition and healthcare, is more exaggerated in developing countries than for people in developed countries. At the same time, obesity and chronic diseases such as cardiovascular disease are becoming increasingly prevalent. Therefore as both conditions exist side by side, Filipinos experience the dual burden of infectious and chronic diseases (McDade et al. 2008).

Comparing tooth loss statistics, less than 3.3% of women in Cebu (age 35-69) were fully dentate whereas 13.3% of U.S. women aged 45 to 64 had full dentition (National Institutes of Health 2002). This suggests that more Filipino women have experienced infection-related tooth loss, likely due to the lack of proper care and perhaps exposure to higher amounts of pathological bacteria. However, it seems that for women in the U.S. (age 45-64) who do have tooth loss, it is more extreme. Approximately 9.7% are edentulous compared to 5.8% for women in Cebu (National Institutes of Health 2002). From this data, it seems that populations in developed and

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

developing countries have different patterns of tooth loss that may interact with other lifestyle factors in complicated ways to influence cardiovascular disease risk.

Individuals in the U.S. have a large variety of foods to choose from regardless of SES, although healthier foods such as fresh fruit and vegetables tend to be less available to the poor. For those in lower socioeconomic levels, fast food and processed goods are often regular fare due to their availability, convenience, and low-cost. This paradigm is the opposite in the Philippines where outdoor markets abound and many poor people can only afford to eat self-cooked, fresh foods (Popkin and Gordon-Larsen 2004). Fast food restaurants are considered upscale and trendy, and they are only located in city centers (Baek et al. 2006). Individuals who have lost teeth naturally shift their diet to softer foods. Whereas women in the Philippines are more restricted to buying unprocessed, fresh foods, women in the U.S. can easily access the softer processed foods. In a 2005 study, Hung et. al. surveyed more than 80,000 U.S. women and showed that individuals ate significantly higher amounts of saturated fat, trans fat, and cholesterol as they lost more teeth (Hung et al. 2005). Comparing U.S. statistics with those of Cebu, CVD prevalence is nearly three times greater in the U.S. (33.9% vs. 12.5%) (American Heart Association 2005; Dans et al. 2005). Considering the diet patterns above, this leads us to us to believe that in the Philippines, where pathogen levels are higher overall, infections and inflammation are more important risk factors than diet (see Figure 2).

In the second series of models, the potential mediating role of CRP in the association between tooth loss and CVD was explored. First, CRP as the outcome of tooth loss was modeled, but the analyses did not show strong or significant relationship. There was not much difference in predictive values of the different levels of tooth loss. However, age and waist circumference were positively and significantly related to elevated CRP. The presence of excreta, unsanitary means of garbage disposal, and an unhygienic food preparation area were also associated with

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

increased risk for elevated CRP (not shown). Thus analyses indicate that tooth loss is not a predictor of CRP levels even though tooth loss is associated with higher CVD risk. These results suggest that the single measure of CRP may not capture the inflammatory effects related to poor oral hygiene. In fact, a study found that biomolecules such as interleukin-6 may be a better inflammatory marker to predict CVD risk in women while CRP is a better marker in men (Fernandez-Real et al. 2001). Therefore, oral hygiene and tooth loss in particular may be related to other unmeasured inflammatory markers.

Next, the role of CRP in predicting CVD was examined. Higher levels of CRP were not found to be significant predictors, but the slightly elevated CRP level does show a significant, positive relationship with increased CVD risk, predicting a 161% increase in CVD risk relative to the comparison group. In an inversion of the order of models, the association between this level of CRP and CVD was weaker before anthropometry, diseases, and lifestyle factors were accounted for. The OR for the most extreme level of CRP is the highest, which may indicate that individuals with CRP >10 mg/L also had greater prevalence of diabetes and/or hypertension, which inflated the predictive value of CRP.

In summary, the results show that hygiene predicts CRP levels, of which the 1.5-3 mg/L level positively and significantly predicts CVD risk. In addition, hygiene predicts toothaches (not shown), which is highly correlated with tooth loss. The most extreme level of tooth loss in turn predicts CVD risk. Moreover, BMI, waist circumference, total amount of kilocalories ingested, and percentage of calories from fat all predict CRP levels (not shown). Therefore it seems likely that tooth loss mediates CVD risk through an inflammatory pathway which is affected by both environmental hygiene and dietary habits.

Limitations

A limitation of this study is the use of qualitative self-report of heart disease status. This could lead to bias because some women may not know their status. An objective method of evaluation of cardiovascular disease presence would circumvent the biases that likely occur as different factors hinder a woman from being aware of her heart disease status. This study was designed as a first attempt at evaluating predictors of heart disease in the original mothers of the CLHNS study, in preparation for more detailed planned and future analysis that will include the objective measure of atherosclerosis in the sample.

In the self-reported survey, a sub-set of women reported onset at young ages. Congenital heart disease and rheumatic heart disease are conditions that have an early onset and are likely not affected by tooth loss, since the latter occurs typically later in life. Those who were diagnosed with heart disease as a child, defined as those 20 years of age or younger, were excluded. Individuals with possible genetic influences, such as familial heart disease, were not excluded from the study. This is a limiting factor because genes are a confounding factor that the study did not have the data to account for. However, early onset heart disease can still be affected by tooth loss, a condition that may aggravate the predisposed problems of the heart. If genetic factors could be removed from the analysis, tooth loss would be a stronger predictor of CVD risk.

Because we only know the number of teeth lost, and not the cause, it is unknown whether tooth loss is due to infection, physical trauma or some other cause. If indeed resulting from infection, the periodontal disease or gingivitis could have occurred over a range of years. Some women may have lost their teeth through infections that ended by the time the 2005 blood sample was drawn. Therefore the women had damage already done to the heart and are at greater

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

risk for heart disease. Tests show low levels of CRP, thus potentially obscuring any relationship between CRP and heart disease.

Including high levels of CRP in the regression models also introduced error into the results. Literature shows that CRP greater than 10 mg/L indicates an active infection (Pearson et al. 2003), which could be due to biological conditions that impact cardiovascular health, thus inflating the predictive value of CPR for CVD risk.

Implications

Logistic regression revealed that there is a strong association between tooth loss and heart disease. This relationship persisted after adjusting for anthropometry, sociodemographics, diseases, and lifestyle. Investigating the mediating effect of inflammation revealed that CRP, a marker of inflammation, was a confounding variable with a masking influence on the relationship between tooth loss and heart disease, not a mediating variable. Nevertheless, the second lowest level of CRP strongly predicted CVD risk. Although the pathway between tooth loss and CVD has not yet been clearly defined, this study finds that tooth loss is strongly predictive of CVD risk, due to possibly unique characteristics of developing countries such as the Philippines. Further studies can investigate the role of inflammation in developing countries by examining other inflammatory markers such as the interleukin family and interferon gamma. Nevertheless, this study sheds light upon the relationship between tooth loss and CVD in the Philippines, where unique lifestyle factors such as higher pathogen levels, healthier foods and restricted access to healthcare influence the interaction between chronic and infectious disease.

Results from this study may be useful in a public health intervention campaign. We advise that the main risk factors for CVD be targeted. Changes in coronary heart disease mortality over periods of several years in different populations demonstrate the role of

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

environmental factors, regardless of genetic composition. Epidemiological studies in upper- and middle-income countries provide strong evidence for the preventability of CVD (Blackburn 1997). Results from both clinical trials and public health trials with risk factor modification (Pearson et al. 2002) form a strong rationale to support the paradigm that controlling major CVD risk factors should control the disease itself.

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Appendix

	Total Sample (n=1619)	Range	
		Min	Max
Anthropometry			
Age (years)	48.37 ± 6.08	35.67	69.33
Systolic Blood Pressure (mmHg)	119.80 ± 20.12	66.00	240.00
Diastolic Blood Pressure (mmHg)	79.69 ± 12.58	40.00	140.00
BMI (kg/m ²)	24.27 ± 4.34	12.26	41.89
Supra-iliac (mm)	28.81 ± 10.06	3.00	65.00
Waist circumference (cm)	81.13 ± 10.83	43.10	123.80
Arm circumference (cm)	29.32 ± 4.00	16.70	43.90
Triceps skinfold (mm)	23.84 ± 7.94	4.00	62.00
Lifestyle Factors			
Income (pesos)	577.64 ± 1205.57	0.60	40246.76
Highest education (grades 0-19)	7.31 ± 3.80	0.00	19.00
Disease & Risk Factors			
Heart disease (%)	7.88		
Hypertension (%)	19.23		
Diabetes (%)	4.76		
Current smoker (%)	16.30		
Teeth complete (%)	3.96		
C-reactive protein (mg/L)	2.58 ± 5.77	0.00	122.60
Past or Present Toothache (%)	46.58		
# of removed teeth (n)	10.83 ± 9.15	0.00	32.00
	Urbanicity rank		
0-5 removed (%)	33.91	40.16 ± 13.87	8
6-15 removed (%)	38.74	40.89 ± 13.61	8
16-25 removed (%)	13.64	39.93 ± 13.63	8
>25 removed (%)	13.70	40.74 ± 12.33	9

Table 1. Descriptive statistics for study participants.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

Table 3. Logistic regression predicting heart disease.

	Tooth loss	CRP	Age	Waist	Height	Income	Urbanicity	Education	Assets	Hygiene
Tooth loss	1.00									
CRP	0.03	1.00								
Age	0.24**	0.07**	1.00							
Waist	-0.10**	0.11**	-0.02	1.00						
Height	-0.05	-0.02	-0.06*	0.23**	1.00					
Income	-0.05*	0.04	-0.04	0.19**	0.11**	1.00				
Urbanicity	0.00	0.09**	-0.09**	0.19**	0.03	0.21**	1.00			
Education	-0.05	0.04	-0.12**	0.15**	0.20**	0.36**	0.27**	1.00		
Assets	-0.09**	0.01	-0.02	0.28**	0.20**	0.48**	0.23**	0.45**	1.00	
Hygiene	-0.08**	0.02	0.00	0.20**	0.14**	0.28**	0.25**	0.38**	0.50**	1.00

* P<0.05
 ** P<0.01

	Model 1 Tooth Loss			Model 2 Anthropometry			Model 3 Sociodemographic			Model 4 Lifestyle & Disease			Model 5 CRP		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Toothloss (5-7)	1.48	0.88, 2.49	0.14	1.47	0.88, 2.48	0.14	1.47	0.87, 2.48	0.15	1.45	0.85, 2.46	0.17	1.46	0.86, 2.47	0.17
Toothloss (8-16)	1.42	0.85, 2.36	0.18	1.40	0.84, 2.35	0.20	1.38	0.82, 2.32	0.22	1.34	0.80, 2.27	0.27	1.34	0.79, 2.26	0.28
Toothloss (17-32)	1.83	1.12, 2.98	0.02	1.90	1.15, 3.13	0.01	1.89	1.15, 3.11	0.01	2.10	1.26, 3.48	0.00	2.13	1.28, 3.55	0.00
Age				0.99	0.75, 1.29	0.92	1.00	0.76, 1.32	0.98	0.91	0.68, 1.20	0.50	0.90	0.68, 1.20	0.47
Height				1.00	0.97, 1.04	0.90	1.00	0.97, 1.04	0.90	1.00	0.96, 1.03	0.86	1.00	0.96, 1.04	0.90
Waist				1.01	1.00, 1.03	0.08	1.01	1.00, 1.03	0.12	1.00	0.98, 1.02	0.97	1.00	0.98, 1.02	0.85
Income							1.00	1.00, 1.00	0.66	1.00	1.00, 1.00	0.81	1.00	1.00, 1.00	0.81
Urban							1.29	0.90, 1.84	0.16	1.21	0.84, 1.75	0.30	1.19	0.82, 1.72	0.36
Smoking										0.69	0.39, 1.22	0.20	0.70	0.40, 1.24	0.22
Hygiene										1.14	1.01, 1.28	0.03	1.14	1.01, 1.28	0.04
Diabetes										2.08	1.13, 3.84	0.02	2.06	1.10, 3.84	0.02
Hypertension										2.76	1.86, 4.08	0.00	2.75	1.85, 4.07	0.00
CRP(1.5-3 mg/L)													1.61	1.00, 2.58	0.05
CRP(3-10 mg/L)													1.02	0.61, 1.71	0.94
CRP(>10 mg/L)													1.67	0.80, 3.51	0.17
R ²	0.0064			0.0098			0.0120			0.0542			0.0596		

Table 4. Logistic regression predicting CRP.

	Model 1 Tooth Loss			Model 2 Anthropometry			Model 3 Sociodemographic			Model 4 Lifestyle & Disease		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Toothloss (5-7)	1.13	0.87, 1.47	0.37	1.11	0.84, 1.47	0.48	1.10	0.83, 1.46	0.49	1.11	0.84, 1.47	0.46
Toothloss (8-16)	1.15	0.89, 1.49	0.27	1.23	0.94, 1.62	0.14	1.21	0.92, 1.60	0.17	1.21	0.92, 1.60	0.17
Toothloss (17-32)	0.91	0.70, 1.18	0.49	1.00	0.76, 1.33	0.98	1.00	0.75, 1.32	0.98	1.00	0.75, 1.33	0.98
Age				1.22	1.05, 1.43	0.01	1.25	1.07, 1.46	0.01	1.24	1.05, 1.45	0.01
Height				0.98	0.96, 1.00	0.03	0.98	0.96, 1.00	0.03	0.98	0.96, 1.00	0.03
Waist				1.07	1.06, 1.08	0.00	1.07	1.06, 1.08	0.00	1.07	1.06, 1.08	0.00
Income							1.00	1.00, 1.00	0.46	1.00	1.00, 1.00	0.50
Urban							1.34	1.09, 1.64	0.01	1.33	1.08, 1.63	0.01
Smoking										1.19	0.89, 1.58	0.23
Hygiene										1.03	0.97, 1.10	0.32
Diabetes										1.33	0.84, 2.11	0.22
Hypertension										0.93	0.71, 1.21	0.57
R ²	0.0015			0.0839			0.0875			0.0891		

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY

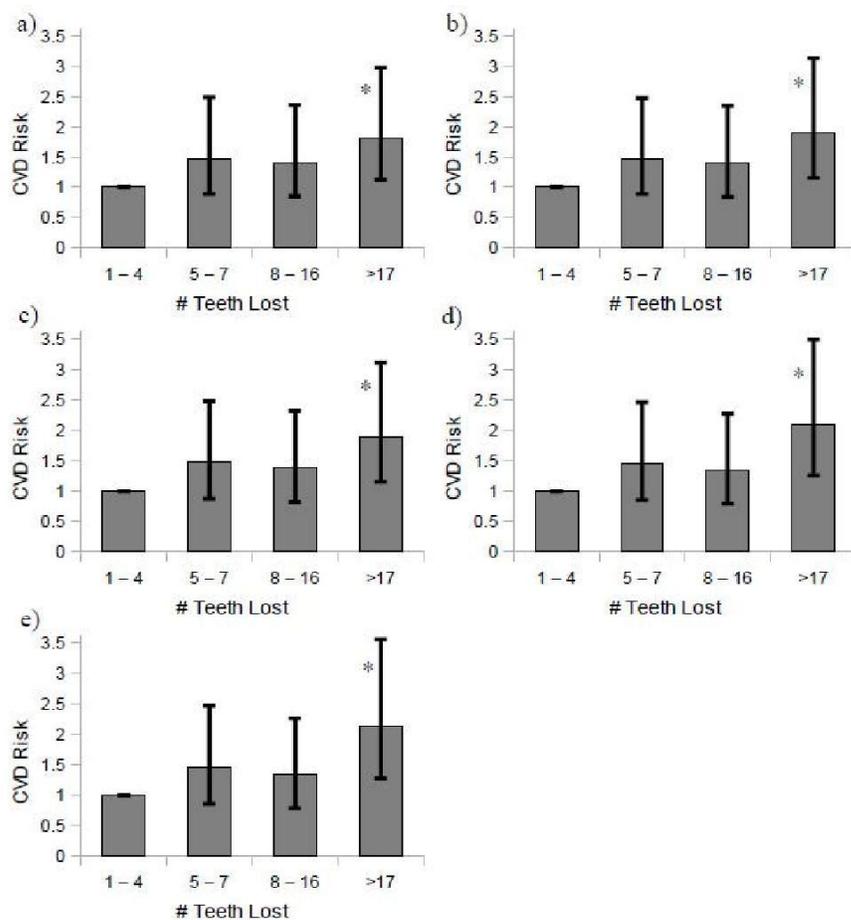


Figure 1. Logistic regression predicting CVD; added predictors: a) tooth loss; b) age, height, waist circumference; c) income, urbanicity d) smoking, hygiene, diabetes, hypertension e) CRP; * $p < 0.05$

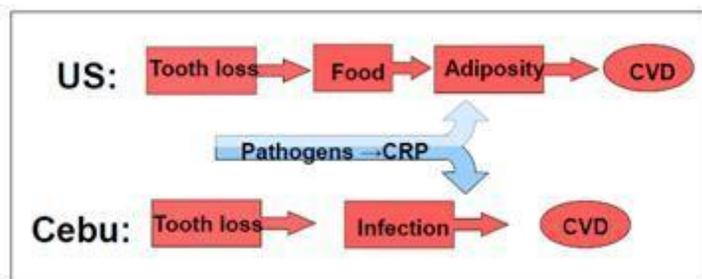
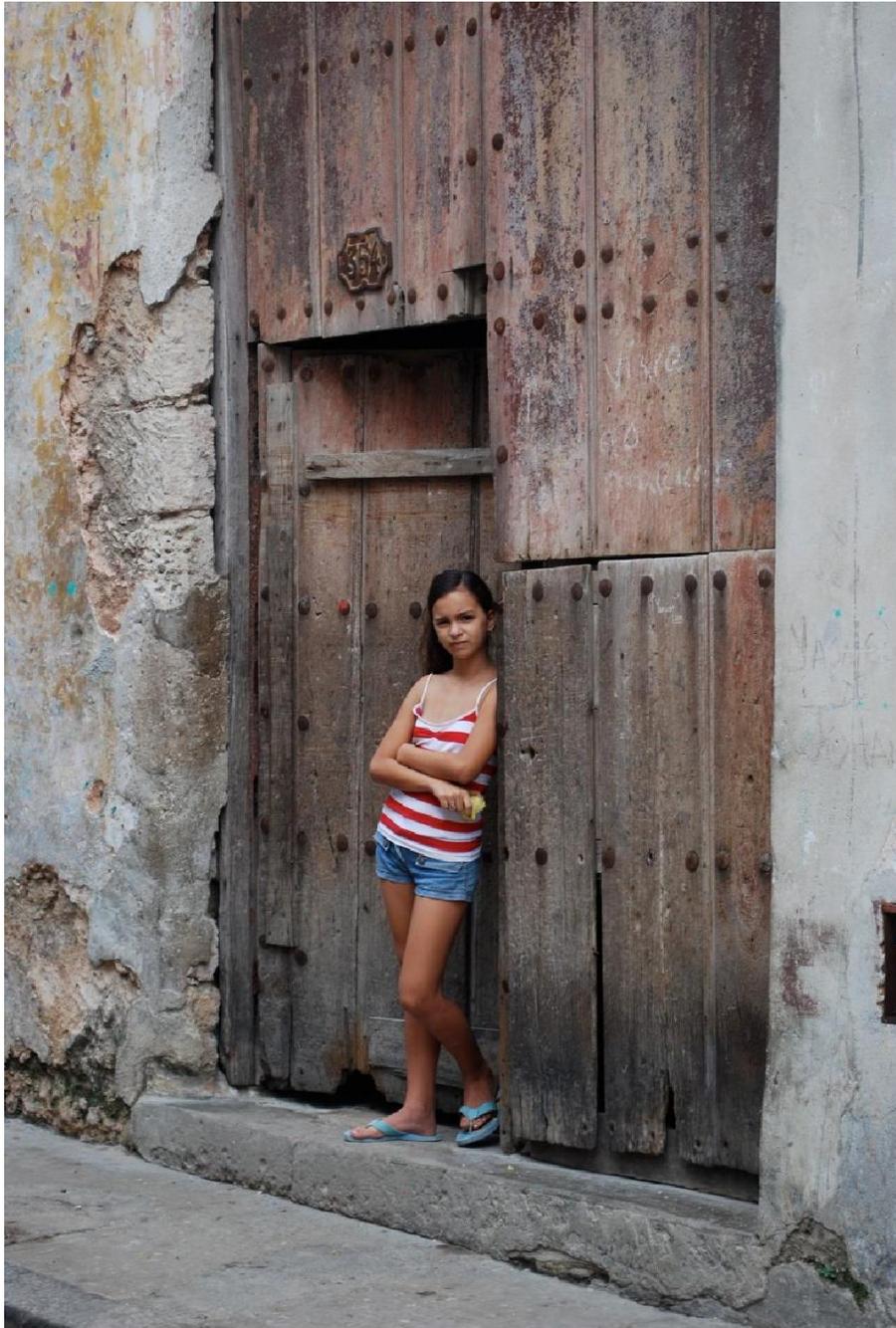


Figure 2. Proposed relationship between tooth loss and CVD in U.S. and Cebu populations.

JOURNAL OF UNDERGRADUATE ANTHROPOLOGY



YOUNG GIRL IN CUBA, BY JACKSON KRULE