Solid Waste Management of Disposable Diaper Sanitation and the Connection to Environmental Awareness for Women in Zanzibar

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Solid Waste Management of Disposable Diaper Sanitation and the Connection to Environmental Awareness for Women in Zanzibar

Micalea Leaska
Fall 2016
SIT Zanzibar:
Coastal Ecology and Natural Resource Management

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Abstract

This project examined the solid waste management of disposable diapers in three locations, Stone Town, Mangapwani and Vikokotoni, within Zanzibar, Tanzania. Its methods included field observations of the solid waste disposal system in Zanzibar and interviews with women about their rationales for buying and using disposable diapers. For one of the first times, the data collected during this project will further assist to educate women about the benefits of cloth diapers and the negative effects disposable diapers create for Zanzibari families and the environment. This study has observed one of the most growing concerns regarding excess solid waste contributing to unsanitary living conditions and the lack of landfill space in Zanzibar. Recommendations were made to local hospitals interacting with perspective mothers and mothers with young children, along with methods to raise public awareness on the subject of household waste and sanitation.
Introduction

1.1 Waste Pollution in Zanzibar

One of the most critical issues associated with global economic social development today is the significant increase in the amount of waste being generated. According to the Global Waste Management Outlook, the global annual increasing rate of Municipal Solid Waste MSW is about 2 billion tons (Ma, 2016). Effective and efficient MSW management is one of the most critical and challenging issues throughout the world (Ma, 2016). Islands in particular face a greater fear of a practical and ecological method to dispose of solid waste without having it consume the island. Unfortunately, these events have already started to take place in Zanzibar. In the Zanzibar Municipality, it is estimated that 360 tons of waste are generated daily. Out of this municipality, only 30% of the waste is collected daily, leaving 70% of the waste to be buried, burned, or discarded on streets or in drains (Informant 1). In Tanzania, there are no sewage-treatment facilities, leading to the problem of waste from these cities and towns being discharged untreated into the environment, mainly into coastal waters through local sewer networks or streets. In most cities and towns, the sewer network is either nonexistent, inadequate or in an advanced state of disrepair. The Zanzibar sewage system dates back to the 1920’s and serves only about 18% of the population (Mohammed, 2002). Uncollected waste is associated with environmental pollution, unpleasant city conditions, contamination of water sources and coastal areas, together with harboring of malaria vectors and other water borne diseases (Vuai, 2009). There has been a shortage of efforts taken to raise awareness of local communities on the issue of pollution and on the fact that it is on the communities own self-interest to maintain sufficient water quality and ecosystem health through reduction pollution (Mohammed, 2002). As a member of the Department
of Environment expressed, “we are beginning to feel direct consequences from the ways we are taking care of nature, we are in a waste collection and disposal crisis” (Informant 2).

1.2 Disposable Diaper Impacts

Disposable diapers contribute a significant amount to daily generated waste from household consumers (Appendix 1). It is estimated that disposable diapers account for 1.5% to 2.0% of municipal solid waste (Ame et al., 2016). Disposable diapers are the 3rd largest consumer item in landfills, and represent 30% of non-biodegradable waste. Disposable diapers were introduced in the United States in 1961 and since then have dominated the market. Disposable diapers account for 80% of the diapers used in the country (Smith). The estimated 27.4 billion disposable diapers used each year in the United States, contribute 3.4 million tons of used diapers to landfills every year. Over 92% of all single-use diapers final destination is in landfills. Disposable diapers represent about 4% of solid waste and in a household with a child in diapers; disposables contribute 50% to household waste (Change Diapers, 2016).

Currently, there are no official government statistical data on the importation, handling and use of disposable diapers in Zanzibar. However, it is apparent that the use of disposable diapers has quadrupled since the 1990’s because local standards of living and the affordability of pampers improved. Currently in Zanzibar, nearly every urban household uses disposable diapers for their children at one point in time. This, along with many other over-the-counter household applications have rapidly and systematically changed the characterization of household waste. Thus, there is an increase in disposal and treatment challenges for the state and community (Ame et al., 2016). A study completed in San Francisco, CA estimated that each American baby uses about 6,000 diapers during the first 2 years of life (Change Diapers, 2016). This U.S. pattern of behavior contributes
to over 16 billion diapers, or 2.7 million tons of single use diapers, that require disposal each year (Ame et al, 2016).

1.3 Composition of Disposable Diapers

The composition of disposable diapers is very assorted in terms of the materials used. Apart from organic waste components absorbed and concealed in disposable diapers (eg. urine, blood, feces, other discharges), it is the use of non-biodegradable polymers that forms the basis of environmental concern regarding disposable diapers. The average disposable diaper composition includes Cellulose pulp (35%), Superabsorbent polymer or SAP (33%), Polypropylene (17%), Polystyrene (6%), Adhesives (4%), and Others (4%) (Ame et al, 2016). For every child wearing a disposable diaper, it creates about 1 ton of waste over the course of two years. Disposable diapers are made of 50 different varieties of chemicals that come into direct contact with the babies’ skin. In addition, most disposable diapers also contain Dioxin, which is a chemical by-product of the paper bleaching process used to manufacture most diapers. Dioxin is a carcinogenic that the EPA has listed as the most toxic of all cancer linked chemicals. In very small quantities, parts per trillion, it can cause birth defects, skin disease, liver disease, immune system suppression and genetic damage in lab animals. Dioxin is banned in most countries, but is not banned in the United States (Ame et al, 2016). The plastic in all disposable diapers is one of the main environmental concerns looked at containing phthalates. These are the plastic softeners and are endocrine disruptors which means they mimic human hormones and send false signals to the body. Some disposable diapers also contain Tributyltin (TBT) and other heavy metals. TBT is considered a highly toxic environmental pollutant that spreads through the skin and has a hormone-like effect in the tiniest concentrations. TBT harms the immune system and impairs the hormonal system, it is also speculated that it could cause sterility in boys (Ame et al, 2016).
1.4 Effects on the Community

Disposable diapers have had negative effects on the communities in Zanzibar. Almost every household has used disposable diapers on their child and continues to add to an ever increasing issue of sanitation and solid waste pollution. When a disposable diaper is thrown in a trash bin, the few that make it there, or littering the roads, the effects of diapers only continue to increase. Disposable diapers generate 60 times the solid waste and 20 times the raw (unprocessed) waste of items, such as, crude oil and wood pulp, materials used in making diapers. Moreover, the manufacture and use of disposable diapers uses 2.3 times more water as compared to nappies (Change Diapers, 2016). Disposable diapers take an estimated 200-500 years to decompose, releasing numerous chemicals into the environment. Furthermore, being composed of over 50 different varieties of chemicals there is nowhere for these chemicals to go once discarded. When disposable diapers scatter the streets and landscape there is little regard to clean up the area for sanitation reasons. People walk over the pampers and live next to illegal dumping areas where feces can be seen leaking out of most pampers. The purpose of this study was to try and bring greater awareness to 3 local communities on the impacts of disposable diapers. Also, with hopes to communicate and reeducate the public about the past methods of using cloth diapers on your child. This method has been used for hundreds of years before pampers were introduced and grew popularity, and can be the method of the future to ensure the safety of babies and environment.
2.0 Study Area

Unguja Island is located in the Indian Ocean 32 kilometers off the East coast of Tanzania, East Africa. Unguja consists of 2 main islands, Unguja Island and Pemba. Since 1964, Zanzibar has been a semi-autonomous State of the United Republic of Tanzania. Although Unguja has its own governmental structure, it still remains under the Tanzanian president. This low lying island has a shallow water table which merely creates further problems with the ability to contaminate water sources faster. With the majority of Unguja’s population concentrated in Stone Town and no water treatment or solid waste treatment facilities, this is a main area for pollution and sanitation issues.

The first study area was Stone Town, also known as Mji Mkongwe, (Swahili for "old town") is the old part of Zanzibar City. Stone Town is located on the western coast of Unguja, the main island of the Zanzibar Archipelago. Former capital of the Zanzibar Sultanate, and flourishing center of the spice trade as well as the slave trade in the 19th century, it has retained its importance as the main city of Zanzibar during the period of the British protectorate. (Discover Mangapwani).
The second study area was Mangapwani, located 22 km north of Zanzibar town in a rural setting. My specific study area was from the beach up to 2 km inland. The permanent population is approximately 1,500 people, since this is a dominant fishing village populations swell every 3 weeks to a population of 3,000-4,000 people. Transients, those who come in from outside locations temporarily consist of fishermen, wives and cooks who stay briefly to make an income and leave again. One main concern with transients is they are causing the utmost pollution and degrading the environment on their temporary stays.

The last area of study was Vikokotoni, located on the outskirts of central Stone Town, past the main road Benjamin Mkapa heading north. This area is still connected to Stone Town but on the outskirts of the urban setting. This area shows very different patterns then those of central Stone Town dealing with the urban environment. The area is directly adjacent to Darajani Market, which is the biggest market area surrounding Stone Town.
3.0 Methodology

There were three main methods chosen for this study including; controlled observations, surveys, and interviews both formal and informal. Throughout this study I engaged with the following government officials, public health officials and significant NGO’s: (1) Zanzibar Municipality Council, (2) Department of Environment, (3) local doctors, (4) nurses and midwives, (5) Creative Solutions NGO, and (6) Kibele Landfill advisors. In addition, interviews and controlled observations took place with general community member, mothers and grandmothers from three locations and local organizations such as Fazach Organization. Interviews were conducted in both formal and informal methods deepening on the topic of conversation, relevance to the subject and if the interviews were planned or sporadic.

3.1 Controlled Observation

Controlled observations were a method used throughout my study to provide key information that could not be obtained through direct interviews and thus was gained through experience. For example, when interviewing at the Kibele Landfill, I used controlled observation to see the categories of waste and the presence of pampers noticeably seen. Controlled observation was vital when walking to different locations to observe varieties of waste on the roads and which areas contained other waste. In addition, using this method allowed further personal information to be noted that would not be appropriate to ask. Using this method allows non-verbal communication, tones, expressions, hand gestures, engagement in the situation, and comfort level to be openly noted and witnessed.

3.2 Interviews

Before each interview was conducted there was a process that had to be followed to allow all interviewees to understand my study and the rights and consent they have to deny any questions
or speaking with me entirely. Firstly, I had to introduce myself and explain the study being conducted and the significance. Next, I explained privacy rights, consent forms and all identifications being kept anonymous throughout my study, recording each name, date, signature and occupation. After this was completed, time would be logged and questions would begin with the aid of a translator as I recorded individual’s responses through note taking. Following my questions, the end of each interview was open for interviewees to ask any questions they might have about my study. This allowed each person to feel the conversation was more personalized and they were not just another statistic to my study.

3.3 Informal Interviews

Informal interviews were mostly sporadic; finding someone in a public area or passing through the streets and having a conversation semi structured towards the topic of interest. These interviews did not typically have predetermined questions and were asked on the spot based on the conversation and information known. Informal interviews were significant to my study because conversations usually covered a broader range of topics that would connect certain subjects or would expose further personal opinions. These interviews being discussed openly in a public atmosphere would help introduce me to other people who had information on the topic of interest. These interviews mainly occurred when people had tea and coffee in the morning in larger group settings which permitted me to engage with various people. A total of 5 informal interviews were conducted in these settings.

3.4 Formal Interviews

Formal interviews involved one-on-one meetings or group settings. Formal interviews occurred in different settings and situations based on the interviewees occupation and residence. Interviews had predetermined schedules, location and times involving mother’s in their
households, doctors and nurses at the local hospital, workplaces of ZMC and Department of Environment, and public meeting ground such as, Fordhani Garden. Questions were prepared before interviews and written in English. Depending on the participant being interviewed, certain situations required the help of a translator to interpret my questions to Kiswahili and translate the responses. Formal interviews had to be structured in a location that was convenient for the participant, and ranged from a 5-minute discussion to more than an hour. To make it suitable for the individual, for example, street sweepers and cart workers were questioned in the early morning when they were already out working and were questioned directly in their area of work. Time and location were very important for the interviews to make sure individuals were not waiting or causing interruption in their daily work that would cost them. In the situation with mothers, they were interviewed individually in their homes, to make the setting more relaxed and open to answer questions. Furthermore, while interviewing in households, I was able to use controlled observation on the appearance and situation of each home. A total of 15 mothers were interviewed formally in their homes in three different locations, with the exception of 4 mothers interviewed in a group setting at the street sweepers headquarters. An additional 14 interviews were conducted formally, and depending on each situation if follow up questions needed to be asked additional interviews were continued at a later time. Two ZMC officials were interviewed at the Zanzibar Municipal Council Office on Creek Rd. One Kibele Landfill employee was interviewed at the Kibele dumpsite A total of seven street sweepers and cart workers were interviewed in various locations of work. A total of one doctor and two nurses were interviewed from the Zanzibar Medical Group in the hospital. Lastly, one interview was conducted with a member of the Department of Environment. See Appendix 3 and all subsections for formal interview questions asked to all above participants in the chronological order as results are listed.
4.0 Results

4.1 Kibele Landfill

The Kibele Landfill was visited October 31st located in Kibele town, 19 km from Stone Town in Zanzibar Central/ South Region. This area buffers Jozani Forest, and was considered a protected area. When construction on the main road started in the area, trucks were allowed to hold their equipment and dump rocks in this space therefore changing the title to a quarry. This is a government owned area, and the families whose houses border the landfill were displaced to different locations. This landfill is considered a temporary location until another location can be determined. Kibele Landfill has been open and running for 2-3 years starting in 2013 (Appendix 4, Figure 3). Before this dump site, the previous location was Jumbi Landfill located in Jumbi, on the boarder of Zanzibar Urban/ West Region approximately 12.5 km from Stone Town. This area is privately owned and is now was closed down due to public complaints of smell, smoke and insect infestation. Previously it had been open for 10 years but has since been shut down for the past 5 years. As Informant 4a explained, “there is an ongoing project to restore the environment in this area by leveling the grounds and removing all waste seen on the outer surface”. The first legal dump site functioning in Zanzibar was Amani Landfill. Since then, there have only been 2 other areas used by Zanzibar Municipal Council, but there are numerous illegal dumping areas seen around the island.

Kibele Landfill is a mass dumping area for all solid waste, excluding medical waste, which is handled directly by hospital incinerators. At Kibele Landfill, ZMC buries all waste by using a bulldozer and pushing the waste towards the rear of the landfill, covering the surface with sand and continuing in this manner, unfortunately, this is not the proper way to bury waste. Currently, the Zanzibar Municipal Council does not own a bulldozer, resulting in borrowing from private
businesses that may either be delayed or have a broken machine, which disrupts the process of burying waste. Solid waste is recommended to be pushed and buried every 3-4 days, currently this is happening unpredictably either on the 3rd day or sometimes as long as 4 weeks (Informant 4a). Informant 3, an employee of this landfill, stated that, “he nor anyone else has never had any health related problems from working here. This is due to the fact that no burning is allowed to take place at the landfill”. Their method for eliminating waste is burying it. That being said, burning does still occur on site and was observed when I was here (Appendix 4, Figure 4). This is because when scavengers come in at night to collect plastics, glass and metals some are also burning the waste as a way to reduce the smell and insects.

This landfill is a mass dumping area with no separation of waste and it is all treated the same in regards to burying it. Currently, ZMC is looking to research pampers and the best way to solve the issue of ever increasing pampers and disposal methods; “pampers are a very big problem because after the baby has used them, there is no further treatment” (Informant 4a). There are no records or data on the types of waste dumped here or the calculation of each waste component and because of this, there is no data on what percent of the dump site is pampers. There is no individual company or NGO that comes to collect plastic or any solid waste to be recycled at the dump, but there is an agent that takes plastics, cans and metals and exports them to outsiders. These are scavengers who collect certain materials to shred, pack and bring them to the market. No further information about this collection is known.

There are regulations and procedures that have to be followed at the dump site by the law. Although, no details were given in regards to the specific regulations required. Currently, the World Bank is working with ZMC to hopefully fund a new complete solid and liquid waste disposal and separation system (Informant 4a). Hopes are that the World Bank will fund a new
bulldozer and help build a fence around the landfill and set up a station to allow 24/7 surveillance to make sure scavengers are not allowed to enter and further burn waste. About 140 tons of waste are brought to the dump site every day from 50-60 disposal trucks (Informant 4a). This statistic is only based on an estimated number of collected waste from the holding containers by those who pay to have household trash collected, but this does not account for waste brought in by private hotels or government waste trucks because they are not scheduled and range dramatically on showing up. Private hotels can bring 2 trucks a day or none at all and a similar pattern is shown with the local government who can come even once a month (Informant 4a). This is the only dump site on Unguja Island, which makes it very difficult for residents living outside of Stone Town to have a place to dispose of their waste. The results of this are shown throughout the island by illegal dumping grounds in fields, low lying areas, beaches or the roadsides.

4.2 Zanzibar Municipal Council (ZMC)

A formal interview with two members of ZMC was conducted October 31st at the Municipal Office on Creek Rd, Stone Town. The main environmental issues this office deals with are solid waste management, road cleaning, and liquid waste sewer lines and cleaning. “In solid waste management there are sufficient ways to deal with the disposal and 80-90% of solid waste is collected” (Informant 4a, 4b). Sanitation issues arise from the fact there is no treatment plant of liquid wastewater, besides draining directly into the ocean. In regards to the amount of pampers discarded in town they explained, “during the outbreak of cholera, people said pampers were the reason because of the improper disposal. Pampers contaminate waterways and land by fecal matter spreading through pampers” (Informant 4a, 4b). Public Health and Environment Act No. 11 of 2012 is directly concerned with solid waste and sanitation issues in hopes to improve the sanitation
in Zanzibar, the implementations of this act are starting to be enforced in all towns (Informant 4a, 4b).

4.3 Street Sweeper and Cart Workers

Seven interviews were completed between 2 street sweepers and 5 cart workers in Vikokotoni Area on November 1st. These interviews were time specific, based specifically on the times the interviewees are working during the day. Street sweepers work every day starting at 5:30am-8:00am, and only consist of women. Men follow after the streets have been swept into piles and start around 7:00am-9:30am every day. Informant 5 and Informant 6 were interviewed working in the garden area boarding Creek Rd, heading towards Vikokotoni. Both women collect tree leaves, mixed rubbish and paper. The most frequently seen waste is plastic, bottles and vegetable waste. Each collects 2 large bags of waste per day. When asked how many pampers they had collected today or yesterday, Informant 5 said about 2 or 3 while Informant 6 said none. Informants 7 through 11 all worked in the core of Vikokotoni on the inner roads and all collect mixed rubbish from households and road waste. The most frequently seen waste consisted of plastic, pampers, food waste and bottles containing urine. When asked the same question, how many pampers have they collected today or yesterday? Informant 7 said to many, Informant 8 said many on the roads, Informant 9 said around 25 or more, while Informant 10 said more than 100, and Informant 11 said around 10. Each cart Worker collected different amounts of waste based on their collecting method, this is shown in Table 1 below.

Table 1: Cart Workers of Vikokotoni

<table>
<thead>
<tr>
<th>Location</th>
<th>Waste Collected</th>
<th>Amount of Waste</th>
<th>Number of Pampers Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stone Town</td>
<td>House rubbish</td>
<td>1 cart</td>
<td>To many to count</td>
</tr>
<tr>
<td>Houses</td>
<td>(pampers, plastic)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vikokotoni Shop St</td>
<td>Mixed rubbish,</td>
<td>1 troll</td>
<td>To many to count</td>
</tr>
<tr>
<td></td>
<td>(road waste, plastic)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Informant 12: An informal interview was conducted on November 1\textsuperscript{st} in the Vikokotoni Streets during tea and coffee hour in the morning. Informant 5 explained the numerous projects he has created over the years to the benefit of Stone Town. ‘Beautiful Zanzibar’ was a project created in 2011 to clean, recycle and teach recycling throughout Stone Town. While working alongside Aida from Creative Solutions, he teaches people in the cultural center about recycling and how to create profit from it. He also has created 63 sub section groups throughout the streets of Stone Town to sweep and collect waste from households, this is still currently the method to collect waste from all households that pay for this service. Some of the biggest problems noticed over the years are plastic straws and pampers. He has begun to work with local tailors to make a form of nappies from scrap pieces collected of cloth and sell them. “Economic status does play a role in the pample use, everyone wants to seem rich by using pampers. Here, you have to show how rich you are and show off how much you have” (Informant 12). Later he also explained babies are smarter then we expect, by teaching a baby to reject a pampers and use the toilet sooner, they will begin to learn.

Informant 13: This informal interview was conducted immediately after Informant 12, this individual interviewed works for a cargo company that travels to different countries to export cargo back to Zanzibar port. All kinds of goods are imported from the main trading companies China and Dubai. Pampers are imported with an estimate between 3-10 cubic meters and showing an
increasing importation trend. He further explained the increase in pamper importation is because older generations used nappies however the generations now have switched to use pampers. When asked the question of which choice he thought was best he said, “it is better to use a nappy or towel because that is what is cleaner and what we need to use” (Informant 13).

Informant 14: This man worked at the cargo dock in Stone Town and expressed his dislike for pampers powerfully. He has observed many pampers being imported and acknowledges they are bad for the environment and also very dangerous for babies, “some pamper infect children and cause a rash on their legs which is a big problem” (Informant 14). Some pampers being imported are those of low quality and these are the most dangerous. Working at the port he has seen how long some containers sit here and said, “it is too unpredictable to know how long a container of pampers has been sitting there or where they have been”. His sister-in-law has a newborn child and she noticed her baby developing a tumor on its upper leg and rash. He encouraged her to use a nappy and soon the tumor and rash disappeared. He explained that working directly with women is better because although some men change their child’s pamper it is unlikely. A woman is the one who knows and sees what is going on with the baby, “women can provide the details unseen to others eyes” (Informant 14).

4.5 Formal Interviews: Case Study between Mothers of Different Locations

Table 2: Diaper Methods Between Communities

<table>
<thead>
<tr>
<th>Community</th>
<th>Use Pampers</th>
<th>Use Nappy</th>
<th>Type of Cloth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stone Town</td>
<td>√</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mangapwani</td>
<td>-</td>
<td>√</td>
<td>Underwear</td>
</tr>
<tr>
<td>Vikokotoni</td>
<td>-</td>
<td>√</td>
<td>Kanga</td>
</tr>
</tbody>
</table>
Table 3: Comparison of Time and Health of Children in Diapers

<table>
<thead>
<tr>
<th>Community</th>
<th>Use Pampers</th>
<th>Use Nappy</th>
<th>Time Child Wears Diaper</th>
<th>Rash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stone Town</td>
<td>✓</td>
<td>-</td>
<td>2 ½ yrs.</td>
<td>✓ and observed</td>
</tr>
<tr>
<td>Mangapwani</td>
<td>-</td>
<td>✓</td>
<td>2 yrs.</td>
<td>Observed fungus from pampers</td>
</tr>
<tr>
<td>Vikokotoni</td>
<td>-</td>
<td>✓</td>
<td>1 yr.</td>
<td>Observed from pampers</td>
</tr>
</tbody>
</table>

Table 4: Cost and Reason Analysis per Community on Diaper Use

<table>
<thead>
<tr>
<th>Community</th>
<th>Use</th>
<th>Cost (tsh)</th>
<th>Ease (Time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stone Town</td>
<td>Pampers</td>
<td>1=400</td>
<td>Easy, globalization, holds urine long</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 Ex= 7,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 Cheap=2,000-5,000</td>
<td></td>
</tr>
<tr>
<td>Mangapwani</td>
<td>Underwear</td>
<td>1 Cotton= 2,000</td>
<td>15 mins to wash, cheaper, safer for child</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Cheap= 1,500</td>
<td></td>
</tr>
<tr>
<td>Vikokotoni</td>
<td>Kanga</td>
<td>1= 4,000</td>
<td>15 mins to wash, cheaper</td>
</tr>
</tbody>
</table>

Graph 1: Comparison of Pamper Use Between 3 Communities
Interviews were conducted with a total of 11 individual mothers and one group interview shared between 4 mothers. The participants of this study were chosen somewhat randomly based on perceived economic status and location. Three specific areas were chosen to interview mothers; Stone Town with the highest perceived economic status, Mangapwani with some perceived economic status and being rural area, and Vikokotoni Area with a perceived lower economic status and boarding the urban Stone Town area.

After interviewing a total of 15 mothers in three different areas, across the board it is clear that over the past decade there has been a cultural shift from traditional ways of life to keeping up with globalization and new efficient ways. When mothers were asked the question why they choose to use pampers over a nappy it was unanimously stated, “nappies are what our parents used, no one wants to use those anymore, we are keeping up with globalization”. To younger mothers of those still in the pregnancy stage, most have not considered the idea of using a nappy instead of pampers. Some mothers said it was ‘nasty’ to clean out a dirty cloth when you can just throw a pamper away. Others said they do not have the time to wash out a nappy each time it gets soiled, pampers were concluded to be the easy way out. Although most of these mothers were stay at home moms, they still would not drift away from using pampers on their children. All of these women have higher economic status and visible decorations from Omen or India were seen around the house. All mothers also said when the pampers are dirty they wrap it tight in a plastic bag and dispose it in the trash bin to be collected each morning. The average pamper was changed 4-5 times a day and was worn for an average of 2½ years. These mothers are spending about 1,825,000 tsh for the total amount of time a child is in the pamper stage. Informant 15 is from Dubai, and had used cloth diapers on her children and was a nurse and midwife in Dubai. She had relatively different approach on using pampers partially influence from what she has experienced working
in a hospital. Although the hospital was in Dubai, there was still sufficient information provided that is also occurring here. She has 3 children and used a nappy on her children when she was at home and only when going out she put pampers on because she did not have access to wash the nappies. Also, she only allowed her children to use nappies for a total of 1 year and then forced them to become potty-trained. Every month she switched nappies to make sure they were clean and when using pampers, changed them every 2 hours. During her time as a nurse and midwife she promoted using nappies as the better form of child care. When a mother would come in to have her first child she would teach them how to use a nappy, hold the child, clean them and basic health concerns and needs. She recommended that mothers use a nappy when they are home and only when going out to use pampers. Informant 15 expressed, “some women are lazy and do not change the pamper for a long time and the baby would develop a sever rash and sores”. She also elaborated on the issues of sanitation and using pampers by explaining “cholera is spread from pampers being left in the streets, when a pamper is dirty and thrown on the roads or in the environment, flies land all over the diaper and feces and then land on food and people. When people ingest the food they are eating the bacteria flies carried with them from the feces to their plates. This is how disease is spread and this is all linked to improper sanitation” (Informant 15). Although there is no scientific recording of cholera being spread through improper disposal of pampers, this is a statement that has been shared by additional people in the community noticing the increase of littered pampers.

Mangapwani was the second location observed and interviewed, as this location has medium perceived economic status, but is also a rural fishing village. An interesting fact about Mangapwani is that for most of the women living in this village this is not their permanent location, rather they come here from the mainland to make money then return home. This could be a possible reason why most women used pampers for part of their child’s younger ages along with using a
kanga and underwear. One of the five mothers interviewed used pampers as the main method on her children. Three of the mothers had very young children while the other two mothers had children who have left the diaper stage already. Three of the five mothers used a kanga on their children during the day and two mother used underwear on their children. Their motive for using underwear was that it was easier to wash and could be bought in bulk. The children here were also in the diaper stage for an average of 2 years. These mothers all said they used pampers on their children at night and changed them twice during the night. If a child wears one kanga for 2 years then this is about 4,000 tsh spent in total for the child. All of the women here disposed of pampers by the means of digging a large hole and burying them. This is because there is no waste pick-up system here, being outside of the municipal boundaries. There was a drastic increase in pampers seen next to the road, around houses, in the woods and along all paths. The mothers interviewed explained kanga’s can be used for long amounts of time. To clean the kanga, if the baby defecates it is dumped into the toilet, but if there is only urine, the kanga can be cleaned and washed outside. It is important to keep the kanga clean. Similar standards for pampers also apply to a kanga, if they are wet then it must be changed and cleaned, since there is no absorbency material present it is easier to notice when the kanga has been spoiled in most cases causing the baby will cry. Mothers expressed their reasoning for using kanga’s and underwear were because it is expensive to continue buying the number of pampers a child safely needs, they know many women in the community that still use kanga’s still. Mothers who used underwear on their children expressed the same opinion, it is easy to clean and dry, and pampers are not only expensive but dangerous as most women leave them on far too long causing a rash.

Vikokotoni was the third area of study, with perceived lower economic status in my case study. A group of 4 street sweeper mothers, labeled Informant 11, were interviewed along with 2
mothers in their homes. All 4 of the street sweeper mothers only used kanga’s on their children because they do not have the income to buy pampers. One kanga could be used for a child’s complete diaper stage and then could get passed on to the next child to use. A kanga would only be replaced if it has torn. This area also had children in a diaper stage the least amount of time with an average of only 1 year. Using a kanga for one year between numerous children could be a total cost of 4,000 tsh. This area makes an average income of about 2,500 tsh a day which would not nearly be enough to buy 4 pampers a day spending a total of 2,000 tsh. “We do not have the money to spend 400 tsh on one pamper to throw it away so quickly, the money we make has to provide food, water and support our families and households. This is why we use kangas” (Informant 11). Some mothers in the group said they might use a pamper on the child at night but the rest of the group contradicted this explaining, “you take a towel and tie it on either side and put spare plastic around the waist and put trousers or pants back on the baby and they can sleep in this”. In the occupation of street sweeping all mothers agreed they have seen an increase in the amount of pampers they sweep up and think this might be due to some women working for businesses out of the house, so they have to use pampers on their child because a maid or nanny will not wash out a nappy. Informants 11 also shared, if they are home and the child is awake they sometimes will not put anything on them to air out the babies’ skin. An additional 2 mothers were interviewed in their houses, near apartment housing. Informant 16 has a very large family and takes care of grandchildren, orphans and neighbors children. Due to taking care of numerous children, she uses pampers because people pay her for taking care of their children in this form. Informant 17 along with Informant 16 both are given pampers as a form of payment for the children they take care of.
4.6 Zanzibar Medical Group (ZMG)

Three interviews were conducted at ZMG November 5th, these interviews were formal individual interviews with a doctor, nurse and laboratorian. The doctor (Informant 18), has worked in this hospital for 25 years and deals with a variety of patients and cases. When asked about perspective mothers and receiving care he explained that perspective mothers come in to have a check-up in their first trimester and throughout the pregnancy then come in an additional 4-6 times until birth. They are also recommended to come in after delivery for a follow up appointment, although, this is not usually followed by most mothers. For those women who can afford it he advises they use pampers, but, is unclear on the reasons why he advises pampers. There is a conversation between patient and doctor about sanitation issues and he has heard recently that pampers may cause cholera and other water borne diseases. Women have never asked him how to use a pamper as they already know from their mothers. When asked if he had seen a connection between economic status and pamper use he responded, “yes, there is a connection between the two because wealthier families use pampers” (Informant 18). He has observed and treated some cases where babies developed a rash from pampers, but they usually are not severe. Over the years he has observed that the disposal of pampers is bad if they are disposed of in waters but does not
see any negative effects of a pamper in itself. When being asked the final question if he would ever advise perspective mothers to use a nappy over a pamper he considered this discussion to continue.

Informant 19, a hospital nurse was younger around 23-25 years old and has worked in the hospital for only 8 months. When perspective mothers come in the nurses’ job is to take care of them. Most women who come in use pampers on their child and use whips to clean the child. When a mother has a C-section and is kept in the hospital based on pain levels she usually wears pampers until she is able to walk to the bathroom in comfort. She strongly advises mothers to use pampers only for a certain amount of time and make a schedule of the times and stick to that schedule. She used the example of when a woman has her menstrual cycle and wears a disposable napkin. “It is uncomfortable for a woman to sit in a disposable napkin for hours so why do that to your child? It is not only uncomfortable for them but causes a rash in numerous cases, I strongly encourage using a nappy on children” (Informant 19). With globalization becoming the stage of life now, nappies have gone outdated and replaced with pampers. When a mother is tired she can just throw out the pamper and put a new one on and not have to wash out the nappy. Similarly, to the doctor, there is a conversation about sanitation and disposable diapers but she said ultimately the decision comes from the mother. It is the mother’s decision to either throw a dirty pamper in the trash or on the side of the road. The mother makes the choice of the method she wants to use and how to dispose of it. She educates women that if you are using a nappy you must wash it out. In addition, when a woman comes to the hospital ready to deliver she already has with her the method of choice to use on her child. So it is now their decision to listen to the nurses about how to use the diaper, cleaning the child, breast feeding, safety, holding the child and the attention a baby requires. When a mother comes to delivery it is already too late to try and advise them to use a nappy this stage must be done when the perspective mother is coming in for check-ups. The problem with pampers is it
creates extreme hotness on the babies’ skin from being confined in material such as pampers. It causes the baby to develop and rash and sometimes wounds or sores where the pamper rubs against the bare skin. “All we can do is try and educate the mother how to take care of the baby and hope they listen but what a mother does with her child is in the end her decision” (Informant 19).

When interviewing Informant 20, who works in the lab, she has worked in the hospital for 2 years now and is around the age of 25 years old. She said that she can see a connection between disposable diapers and health related issues, such as cases of skin diseases are caused from poor sanitation. “We have been taken out of our tradition and now in the globalization stage where nappies are considered a thing from the past and people use pampers. For those who do not have money they continue to use nappies but those who have seen economic growth use pampers” (Informant 20). She considered encouraging her friends and relatives at home to use a nappy instead of pampers as well.
5.0 Discussion

After studying three very different locations it can be determined that disposable diapers hold a large presence on the island and a big issue in regard to health, sanitation and the environment. Each community studied used diapers in a different way, based on their specific setting. Stone Town, an urban setting for the large majority, uses pampers on their children. Mangapwani consisting on a rural fishing village, the majority of women are using underwear as a form of cloth diapers. Vikokotoni, located on the outskirts of Stone Town mostly consisting of apartment block housing, the majority of women use kanga pieces on their children. All of these methods of diapers are very different and play different roles in the effect they have on sanitation, health, and the environment and economic status.

5.1 Disposal Methods

With the increase in pamper use, each area studied disposes of pampers differently. In Stone Town, lying within the Zanzibar Municipal Council households have to pay 3,000 tsh per month to have their trash collected every morning. The mothers interviewed in Stone Town all had this service and said they wrapped a dirty pamper tight in a plastic bag before they dispose of it in the waste bin. This method can be seen every morning when cart workers collect the trash to bring to containers. One issue from this process is the mistrust of people. Some people who do not pay for the service throw their trash on the streets, but the trash still has to be collected otherwise left in the environment. Also, at night some people will dump trash out of others bins to steal them and sell for drug money. This has made people uncertain of trusting the system and paying for waste to be collected.

Another expressed concern was seen when observing the containers in Stone Town. Cart workers use their hands, some without gloves, to take waste from the cart and throw into the main
holding containers. Many times objects would miss and containers overfill frequently because they are not collected regularly. Within the streets of Stone Town, smaller containers can be found overflowing with animals climbing inside. The waste had blown over the road and visible dirty pampers could be seen unwrapped. The large containers located across Darajani Market are one of few areas to dump waste, this area is also a parking lot where people sit and fish are left in buckets to later be sold. The smell is very strong and sanitation conditions are very poor. These are the holding containers that ZMC collects to bring to Kibele Landfill.

Similar results were also recorded in Vikokotoni Area. Cart workers either had too small or broken carts that were over filled, causing waste to spill over while being brought to the containers (Appendix 4, Figure 5). Many do not use gloves since they have to buy gloves themselves. Informant 21, a cart worker in Vikokotoni and my translator, tried talking to other workers explaining the need to wear gloves as they pick up raw waste. With the lack of money these workers make, a cheap pair of plastic gloves will rip in hard labor and have to be replaced daily. A stronger more durable pair of gloves will cost more money than they make in a week and they cannot afford them. One of the biggest waste areas was outside block apartment housing. Large containers are placed here but with narrow roads ZMC trucks face problems reaching these containers. Also, these containers are always filled and the areas covering around the containers are piled with trash. People claim those living in the apartments do not dispose of trash in waste bins but rather toss it over the sides and aim near the containers. This creates loose trash piles close to the first floor apartments, smaller walkways and also where the public water pumps are. Another concern with the collecting system is after the street sweepers and cart workers are finished, shops begin to open their doors and sweep their waste onto the roads, covering the streets in waste again. The main objects seen scattering the streets are; pampers, plastic and bottles filled with urine.
Recently there has been a regulation that businesses are required to have a waste bin at their shop, but as seen, this regulation is not being enforced. Outside the main streets in Vikokotoni, ZMC does not collect waste, it is the household’s responsibility to bring their waste to the main containers. Communities outside the ZMC collection service face a larger concern of how to dispose of their waste. This was shown in my study in Mangapwani village. Although the majority of women here use a form of nappy, the visibility of pampers seen on roads, fields and next to houses was astronomical. One reason for this could be living in a rural area there is no collection service. This causes people to dispose of their waste by the means of burying waste in the ground. All types of waste are buried into their holes; some buried and pushed over or burning to reduce waste. Burning pampers further emits the 50 chemicals used in a pamper into the air and environment for people to come into contact with inhaling. Burning waste also leads to another concern with polluting the shallow water table. These toxins are burned into the soil and do not decompose for 200-500 years, causing toxins to separate from the material and seep into the soil. Living on a tropical island the weather only aids this process by rains creating direct contact from feces into the soil and further reaching the water table and aquifers. Once this stage has been reached, pollutants spread to every area within the aquifer creating health concerns for those using the water. There seems to be a difference in the amount of waste in Stone Town, Vikokotoni and Mangapwani, but it is more a matter of where the waste is being hidden. Out of sight, out of mind plays a large factor in this process. Those in Stone Town who have their waste collected are able to eliminate waste from their homes, but the waste continues to site in close proximity to their homes waiting in containers with hopes to reach the landfill. In Vikokotoni people throw waste out of their windows or on the roads and paths they take. In Mangapwani, it seemed there was more waste scattered in the village comparing with the others. This was only due to the fact there
is no containers to hold all the waste being produced. Instead, it is covering every path and area of grass. There is only so much space to bury waste and eventually this will run out. The issue of disposal and collection of pampers is a serious issue that is only increasing health and environmental impacts.

5.2 Disposable Diapers Impacts on Communities

After looking at three different communities there is a distinctive pattern with the use of diapers effecting the community’s health. Most disposable diapers contain Dioxin, which is a chemical by-product of the paper bleaching process used to manufacture most diapers. Dioxin is a carcinogenic that the EPA has listed as the most toxic of all cancer linked chemicals. In very small quantities, parts per trillion, it can cause birth defects, skin disease, liver disease, immune system suppression and genetic damage in lab animals (Ame et al, 2016). A single disposable diaper is composed of 50 different chemicals that come in direct contact with a babies’ skin. If there is a connection between pampers and health effects why do so many people still use them? From interviews with mothers in Stone Town, Informant 22 claimed her child would get rashes on their sides, as she only changed the pamper every 5 hours. The other mothers claimed no rashes have been seen on their children but they have observed many rash and health effects on their neighbors and friend’s babies. This could imply, when put under pressure of answering questions it is easier to share an experience in the third person rather than a personal experience. The average time a baby is kept in pampers is 2-2 ½ years while being changed 4-5 times a day. This would amount to 4,500 pampers used over the course of time.

In Mangapwani the majority of women use underwear and pampers are used mostly at night or when going out for extended periods of time. At night the average pamper is changed 2 times and the child spends a total of 1 ½ years. Also, the cases of rash or sores were less frequently
seen here because underwear is used as a form of cloth diapers and can be washed and re-worn. Underwear is made to fit more comfortably to a babies’ legs and not causing friction from rubbing since the material is cotton, not harsh chemicals. Although, it was noted some mothers said if they left pampers on too long a fungus could develop on the babies’ legs. It was noted that underwear used as a nappy can be worn for 8 months before tearing.

In Vikokotoni similar results were observed, as the majority of mother’s use kanga’s as a form of cloth diapers. Informants 11 said they change the kanga piece every 2 hours to avoid a rash as they have not had any on their children. Kanga pieces are another form of cloth diapers and can be washed and re-worn for a year or even passed onto the next child until torn. The mothers who use pampers in this area, use this method because they are given pampers as a form of payment for taking care of other children along with their own. In Vikokotoni, the average pamper was changed the least at 3-4 times a day, meaning the child could be in a soiled diaper for 7-8 hours.

An interesting point to compare is the time children spend in diapers changes dramatically based on the form of diaper worn. In Vikokotoni, those who used a kanga only kept the child in this for about 5 months, compared to mothers who received pampers wore them for an average 1 ½ years. It is shown that those who use a form of cloth diapers do not have to keep their child in this stage as long as those wearing pampers. This is because when a baby is only put in pampers and compounds in these are made to absorb liquid better to prevent the baby from having the sensation of sitting in wetness. When a child wears a cloth diaper, studies have shown they react quicker to the sensation and therefore want the sensation to go away being potty-trained quicker. This is important because when babies become trained to using a bathroom there will be a decrease in pampers being used and less waste in the environment.
Mothers in each of the communities expressed how dangerous pampers can be to a child’s health. They are aware of the negative effects of leaving a pamper on a child too long and the rash that forms because of this. Also, they have seen cases when a baby has a pamper tied too tightly to their skin creating serious health effects. Everyone knew someone who’s child is suffering from a sore, rash or health issue. Yet, when interviewing Informant 19, she suggests if mothers are going to use pampers it should be changed every 2-3 hours. If a nurse recommends this is the amount of a pamper should be changed to prevent health effects from developing, then why are babies being kept in pampers for an additional 3-6 hours? The need for additional educational awareness on pampers health effects and sanitation risks is extremely important to promote and spread through communities.

5.3 Trends of Globalization

Why is the use of pampers continuing to rise with health and sanitation risks? This answer was found when looking at the trends of globalization. A developing country is only as strong as the developed world it follows. In some instances, this can be a positive thing, the increase in technology, advances in trade and marketing, but this can also come with negatives that are hold to control. When pampers were first introduced to the United States in 1961, it created an ever growing monopoly market for every country to catch on to (Smith). With the rise of this new invention, it soon became associated with higher economic status, by dropping the traditional methods of using a kanga and trading it in for a higher status symbol, the pamper. Today, thousands of tons of pampers are imported through cargo ships to Zanzibar and elsewhere from China and Dubai (Informant 14). To have your child wear a pamper shows your family has economic status and is wealthier than those who do not. Therefore, the image of having a pamper on your child is a status symbol.
Pampers come at a costly price along with a high status symbol. One pamper costs 400 tsh, and to wear 5 pampers a day for the average of 2 years is 1,440,000 tsh. To spend that much money on one child’s diapers is not possible for some families here as they do not make enough money to buy pampers, food, water and provide for their families. Instead of switching back to the traditional safer method of a nappy, people are still grasping to the status symbol pampers hold. Meaning, they would rather leave a pamper on their child longer then not have the money to buy more to change them. Comparing this to the cost of 1 cotton underwear which is 2,000 tsh or to a kanga that is 4,000 tsh and can be wore for months or years until torn there is a large price difference. Not only is it more practical to use a nappy, but using pampers and not following the health precautions can be a costly and expensive battle for a child’s health.

Living in an urban setting such as Stone Town, there is a higher economic status that follows the environment. Places such as Mangapwani are placed at a medium economic status, and places such as Vikokotoni are placed at a lower economic status. Status was also demonstrated when mothers were asked why they choose each diaper option. To define a community of high status in this study is to compare the prominence and significance of pampers in communities. Although Vikokotoni could have higher status in certain situations for the presence of pampers being used in the community it has the lowest, determining it to have lower economic status in this situation.

What is the reasoning for the method each mother chooses to use on their child? Stone Town, a community of higher economic status determined the reasons for using pampers were quicker and easier to use by throwing them out after. Informant 23 stated, “we are only keeping up with globalization, using a nappy is what our mothers used on us, it is a method from the past”. Although many mothers did admit that using a nappy may be more sanitary they were content with
using pampers on their children. When the same question was asked to the women in Mangapwani they said they preferred underwear because it does not cause rash and only takes 15 minutes to wash. A mother of 2 girls said, “it is difficult to always buy pampers and have the money to spend on so many pampers for one child” (Informant 24). Similarly, in Vikokotoni, the street sweepers mothers stated they do not have the income to spend on most necessities in life, never mind on pampers. “We are poor, we cannot spend the little income we make on something that it used one and thrown away”, Informants 11 emphasized to me. Other mothers in this area who are given pampers said they like pampers because they hold urine for long periods of time and are easy to take off the child and throw away. A younger mother here said, “it is dirty to wash out a babies’ feces and reuse the material” (Informant 17). All the mothers who said the main reasons they use pampers were because they are easy and quick to use and discard, but do you save time using pampers? It takes about 15 minutes to wash out a nappy each time its soiled. Pampers might only take a few minutes take off, throw away and put a new one on, but what about the overall time taken to buy pampers? If a baby goes through about 5 pampers a day and packages are bought in 12, then every 2 days’ women have to go to the market to buy pampers, for just one child. Although there was no specific study done comparing time used on each method, it can be assumed that time is not the main factor women are buying pampers for their children. What they may be paying for is the higher status and acknowledgment from community members who can see their child wears pampers. Three mothers whose main method was a form of cloth diaper said when they went out they would change their baby into pampers. Is this to show higher status or for practical reasons. Informant 24 was interviewed in Mangapwani and had pampers on her children and said it was because she went out briefly that morning. In this case pampers were not used to keep urine and feces contained for a long amount of time, but was used to show she had the ability to buy pampers.
for her child. These examples support the question if economic status plays a role in the use of pampers.

5.4 Factors Impacted in Study

There were some factors that have impacted my study and due to uncontrolled factors some information was upheld which prevented further information. For example, information regarding the importation of pampers could not be accessed due to bureaucracy. With access to the number of pampers being imported this would help analyzing the increase in pamper use in Zanzibar and how many pampers are being imported mean that is the number in landfills or in the environment also. Also, disposable diapers and the impact they have on health and sanitation of the environment has not been studied in depth in Zanzibar before. Because of this, statistics from other countries had to be used to look at the effects of pampers. In addition, there were some issues regarding what questions could be asked on sensitive subjects pertaining to the sanitation system and lack of regulations for solid waste. Some people did not want to be involved in my study because it involved the government. This occurred especially trying to find translators, as 4 different translators were suggested to be used. After translating at the Kibele Landfill one translator did not want further connection with my study and 2 others never showed up. This created issues when I had to postpone interviews to find another translator. Furthermore, the translator I used for most interviews spoke intermediate English and some interview questions were lost in translation or could not be found in his English vocabulary and had to be skipped. Also, access to interviews at the main hospital in Stone Town could not be completed due to bureaucracy rights they did not want someo one conducting a study evaluating their ways. Due to this, I was only able to interview the smaller local hospital that did not mainly deal with perspective mothers. Some bias was present throughout my study in particular interviews with mothers. This was due to not having many
connections with women in Zanzibar. In Stone Town, previous and current SIT mothers were interviewed because they were aware of the studies students conduct. Working with Anuna, I was able to contact and visit the moms with her help while she translated most interviews. This bias also occurred in the other two locations as I only had access to interview mothers my translator knew. Although I hoped to interview perspective mothers and mothers with young children, I was only able to interview mothers with young children, preventing the ability to educate mothers on cloth diapers before they choose the method to use on their child. Due to these factors some information in my study could not be given or explained in greater detail.
6.0 Recommendations

Overall, a significant amount of information is still needed on the topics of disposable diaper sanitation and impacts on communities in Zanzibar. Throughout my study a key concern was the lack of information and awareness there is on the issues regarding pollution, sanitation, health in communities. Looking towards the future, there are certain recommendations that can aid future studies and raise educational awareness. Awareness needs to be raised about the role of status in decisions about public health for each community. This type of educational awareness has been done before and has not proved to be as significant, rather, reaching awareness needs to be more specific and directed to public health officials.

By promoting awareness through brochures and public presentations this will provide direct information regarding pampers and cloth diapers. Mothers will have the opportunity to look at a second option of diapers that is cheaper, easily accessible, durable and benefits the health and sanitation of their child and surrounding environment. A mother’s main concern is the health of her child. When a mother is well-informed about the risks and dangers of using pampers on their children there might be a change to the value placed on pampers. Spreading educational awareness does not need funding, but should be encouraged locally through members of the community. As a prominent medical doctor that advises the government stated previously, he advises women to use pampers but is unsure of his reasoning for this. If educational understanding could be promoted within hospitals when mothers come in for checkups throughout their pregnancy they could be advised about the difference between cloth diapers and pampers. Reaching out to mothers early in their pregnancy could influence a mother’s decision away from pampers and using what is practical and safe for her child. Another way to bring awareness about sanitation issues within the community is hiring additional workers to work simultaneously with street sweepers and cart
workers with the goal of interacting and spreading awareness in their communities. Community members would be working within their own living environment and creating a more comfortable setting to bring educational awareness to the public about how to dispose of waste properly, sanitation issues and health connections caused by improperly discarded waste. Further examples are dialogues regarding solid waste, what types of waste should be discarded in waste bins, how often the bins should be brought to a holding container, health issues related to exposed liquid waste, disposing of pampers properly, emptying feces into the toilet before discarding and lastly the benefits of using a nappy. Furthermore, with the support and funding from pertaining NGO’s, containers should be placed in all communities around Unguja Island. This would not only benefit communities who do not have a way of disposing waste, but also generate an incentive for people to throw out waste in a container nearby rather than around their houses, further benefitting their direct health. This project could be sustained by a NGO that distributes containers, collects and brings solid waste to Kibele Landfill every week. To place containers in communities outside Stone Town, they could use Stone Town as a model to follow by disposing of waste in containers to be collected. Finally, more research should be done regarding the issues of disposable diapers creating health and sanitation issues and the need for public awareness.
7.0 Conclusion

This project studied the solid waste management of disposable diapers in the areas of Stone Town, Mangapwani and Vikokotoni, Zanzibar, Tanzania. The methods used in this study were controlled observations, interviews, both formal and informal, and surveys. The information gathered from this study was comprised from working with mothers about their rationales for buying and using disposable diapers. The data collected during this project will be made accessible to the public in hopes of assisting women to learn about the benefits of cloth diapers and the negative effects disposable diapers have had on families and the environment. This study has attempted to spark an interest within communities concerning sanitation, health, and their environment. In the last 10 years, pampers have grown in popularity to dominate the market of diaper methods, further decreasing the traditional use of cloth diapers. Using a diaper that is composed of over 50 different chemicals coming into direct contact with human skin cannot go unseen as sanitation and health issues continue to rise. Once a correlation is made between sanitation and health issues through educational awareness, changes will start to be recognized. By delegitimizing pampers of their status symbol it can be hoped that nappies will become the leading diaper method in communities once more.
References:


The only way to change diapers is one baby at a time. Real ... (n.d.). Retrieved October 10, 2016, from http://www.webinfobits.com/page/79f14ed3dd0b


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Appendices

Appendix 1: Diaper Types and Interchangeable Vocabulary

Cloth Diapers- are reusable cloth usually made from natural fibers (Such as cotton, wool, bamboo, and unbleached hemp). Typically, having a water resistant outer layer and absorbent material inside that allows the baby to defecate and urinate while being contained in the cloth. These diapers can be washed and reused numerous times.

Disposable Diapers- The average disposal diaper composition includes Cellulose pulp, Superabsorbent polymer or SAP, Polypropylene, Polystyrene, Adhesives, and Others. Most disposable diapers also contain Dioxin. This is a chemical by-product of the paper- bleaching process used in the manufacturing of most diapers. Dioxin is carcinogenic. In fact, the EPA lists it as the most toxic of all cancer-linked chemicals. In very small quantities (parts per trillion) it causes birth defects, skin disease, liver disease, immune system suppression & genetic damage in lab animals. Dioxin is banned in most countries, but not the United States (Ame et al, 2016).
Appendix 2: List of Informants Listed in the Order Referenced

Date, informant number, profession, location of interview, type of interview:

November 1, 2016, Informant 5. Vikokotoni. Public Works Employee. Formal Interview
November 1, 2016, Informant 8. Vikokotoni. Public Works Employee. Formal Interview
November 1, 2016, Informant 12. Vikokotoni. Community Leader. Informal Interview
November 4, 2016, Informant 17. Vikokotoni. Mother. Formal Interview


Note: All informants are designated via a number to maintain their confidentiality.
Appendix 3: Formal Interview Questions

3a: Kibele Landfill in Kibele

1. How long has the dump site been open?
2. What types of waste get disposed here?
3. What are the methods to destroy waste?
4. Is this a healthy work space?
5. When burning the waste, what types of safety and health precautions are taken?
6. Are pampers being burned with other waste?
7. What percent of the dump site is pampers?
8. How are pampers kept in the dump to avoid sanitation issues?
9. Have you noticed an increase in the amount of pampers?
10. What land surrounds the dump?
11. Do you know what pampers are made of?
12. Is any waste given to recycling and waste organizations that collect? (Zanrec)
13. Are there any regulations at the dump site?
14. How many dump sites have been open in the last 10 years?

3b: Zanzibar Municipal Council in Stone Town

1. What environmental issues does this office deal with?
2. How is the environment in Stone Town (pollution level, sanitation)?
3. What are the main sanitation issues?
4. Is there a problem with the amount of pampers discarded in town?
5. What are the laws of solid waste management here?
6. Have any solutions or regulations been put in place to help these issues?

7. Would Zanzibar consider banning the importation of pampers as plastic bags were ban?

3c: Street Sweepers and Cart Workers in Stone Town and Vikokotoni

1. What type of waste is being collected?

2. What is the most frequently seen waste?
   a. Plastic   b. diapers   c. cans   d. food   e. paper goods

3. How many days a week do you work?

4. About how much waste is collected per day?

5. What are the dirtiest areas of Stone Town that you clean up?
   a. This question was altered to; what area in Stone Town or Vikokotoni do you clean up?

6. How many diapers a day on average do you collect?
   a. When you collect a diaper do you throw the entire thing with other trash or separate it?
   b. When you collect pampers, do you throw it with other waste or separate it?

3d: Mothers and Grandmothers in Stone Town, Mangapwani, and Vikokotoni

1. How many children do you have?

2. Do you use pampers on your child?

3. What types of diapers do you use? Cloth (what type) or Pamper?

4. What brand of pampers?

5. How many times a day do you change your child’s pamper?
6. How long does your child stay in the stage of wearing diapers?

7. How often do you buy diapers? How much? (For both forms of diaper)

8. How do you dispose of used pamper? Or how do you clean cloth diaper?

9. Do you notice any rash, infection or illness when your child is wearing pampers?

10. What is your reasoning for method of diaper you use?

3e: Zanzibar Medical Group in Stone Town

1. How long have you worked in the hospital?

2. Do perspective mothers or mothers with newborns come in for check-ups?

3. Do you ever try and advise mothers to using diapers? Pampers of nappy?

4. Have women asked you how to use pampers?

5. Is there ever a conversation about pampers and sanitation?

6. Based on your hospital experience, do you see a connection between economic status and pamper use?

7. Have you seen any health problems related to a child wearing pampers?

8. Would you ever encourage or advise a mother to use a nappy instead of pampers?

9. What have you noticed about pampers and sanitation issues?

3f: Zanzibar Department of Environment in Marubi

1. What environmental issues does this office deal with?

2. How is the environment in Unguja? (pollution level, sanitation)

3. What are the main sanitation issues?

(The rest of interview was conducted informally and questions asked on spot.)
Appendix 4: Photographs/ Figures Not Included in Text

Figure 3: Kibele Landfill

Figure 4: Burning Waste at Kibele Landfill
Figure 5: Pampers at Kibele Landfill

Figure 6: Cart Worker Carrying Overflowing Waste Through Vikokotoni Streets
Figure 7: Four Main Diaper Types
Appendix 5: Brochure for Community Members

Nappy vs Pampers

How to keep your space clean:
- When using a Kanga, use soap and rise all feces in toilet
- If using pampers, rise feces in toilet before discarding
- Discard in waste bin
- Make sure waste bin is cleaned out daily to be collected or put in holding container
- Change pamper every 3hrs for child’s health
- If baby develops rash stop using pampers
- DISPOSE OF PAMPERS IN BIN ONLY
- Littered pampers can contribute to the spread of bacterial disease

Keep your Island clean and use a nappy/kanga on your baby instead!
- Avg. money spent on pampers for one year is 730,000 tsh
- Pampers contain 50 different varieties of chemicals
- Pampers take about 500 years to degrade in the environment
- Nappy/ Kanga are better for your child and environment

How to keep your space clean:
- When using a Kanga, use soap and rise all feces in toilet
- If using pampers, rise feces in toilet before discarding
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- DISPOSE OF PAMPERS IN BIN ONLY
- Littered pampers can contribute to the spread of bacterial disease

TOTAL EXPENSE: 6,200 tsh
- Kanga = 4,000 tsh
- Baby powder = 1,000 tsh
- Dettol Soap = 1,200 tsh

Can be reused until torn

TOTAL EXPENSE 1 yr. = 720,000 tsh
- 1 Pamper = 500 tsh
- Baby Powder = 1,000 tsh

Single Use only: Disposed of improperly causes health and sanitation risks

What Pampers are doing to your environment?
When pampers are not disposed of properly they emit feces into the land around them, including the streets
For every child wearing pampers they contribute about 1 ton of waste over the course of two years
Pampers can cause rashes, sores and serious health issues to the child when left on longer then 3 hours

Brochure 1: English
Nepi Badala ya Pampasi

Vipi Unaweza kuliweka eneo lako safi:

- Tumia Kanga kuweka kinyesi ndani ya choo na tumia sabuni.
- Ikiwa unatumia weka kinyesiri chote katika kabla ya kuitupa.
- Tafadhla weka ndaini ya matokeo yetu kwa taka taka.
- Tadhali hakikisha debe la taka taka ni safi kila siku.
- Tadhali badilisha pemensi kila baada ya masaa matatu.
- Kama mtoto anafanya upende juziwe kubadilisha pemensi.
- Tafadali weka Pemensi katika debe la kuweka pemensi tu.
- Taka taka zinazotokana na Pemensi zinaweza kuchangia maradhi yanayotokana na bacteria.

Napi / Kanga:

JUMLA YA GHARAMA : 6,200 tsh
- Kanga = 4,000 tsh
- Poda ya Mtoto = 1,000 tsh
- Sabuni = 1,200 tsh

I naweza kutumaka kwa muda mrefu

Pemensi:

JUMLA YA GHARAMA kwa mwaka 1 = 720,000 tsh
- Pemensi moja = 500 tsh
- Poda = 1,000 tsh

Inatumika mara moja tu: Ikiwa haikuwambuzi vya vizi huwasababisha madhara ya kiafya na usafi wa kimazingira.

Je Pemensi zinaweza nini katika Mazingira Yetu?

Ikiwa Pemensi hazikuwambuzi vya vizi zinaewea kusambaz kinyesi katika maeneo yetu, pamoja na mitaa yetu.

Watoto wanaoerufikiwa pemensi kuchangia kama tani moja ya uchafu katika miji yetu kwa zaidi ya miaka miwili (2) tu.

Pemensi zinaweza kusababisha upele, mapunye na athari kuwa ya kiafya kwa Watoto wanaovalishwa kwa zaidi ya masaa matatu (3)

Brochure 2: Kiswahili