A Microfinance Approach to Healthcare Distribution

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Abstract
Microfinance has become a global tool in providing financial support for the world's most vulnerable. Unfortunately, a lack of stable income sources for these populations results in high rates of default, and thus, high interest rates attached to microfinance loans to compensate. Social enterprises and large corporations alike have launched micro-distribution initiatives that seek to provide local communities with means of transportation along with commercial products through microfinance loans, and in turn, these ‘micro-entrepreneurs’ distribute finished goods in order to overcome the high cost of last-mile distribution for the corporation. While this model has been typically utilized for retail businesses, given the drastic need for healthcare and the lack of existing infrastructure in many rural places across the globe, we propose incorporating this model to improve healthcare access. Specifically, we propose the creation of a platform that mobilizes and trains the large population of unemployed youth in South Africa to become community health-workers and complete deliveries of chronic medicines from pharmacies to individual households. This model has the potential to not only make a large impact in improving healthcare outcomes but can also be financially sustainable and profitable if deployed correctly.

Keywords
microfinance, healthcare access, medical supply chain, South Africa, medical last-mile

Disciplines
Community Health and Preventive Medicine | Entrepreneurial and Small Business Operations | Health Economics | Health Services Research
A Microfinance Approach to Healthcare Distribution

By

Aris Saxena

An Undergraduate Thesis submitted in partial fulfillment of the requirements for the
WHARTON RESEARCH SCHOLARS

Faculty Advisor:
Dr. Mark V. Pauly
Bendheim Professor, Department of Healthcare Management and Policy

THE WHARTON SCHOOL, UNIVERSITY OF PENNSYLVANIA
MAY 2020
Abstract

Microfinance has become a global tool in providing financial support for the world’s most vulnerable. Unfortunately, a lack of stable income sources for these populations results in high rates of default, and thus, high interest rates attached to microfinance loans to compensate. Social enterprises and large corporations alike have launched micro-distribution initiatives that seek to provide local communities with means of transportation along with commercial products through microfinance loans, and in turn, these ‘micro-entrepreneurs’ distribute finished goods in order to overcome the high cost of last-mile distribution for the corporation. While this model has been typically utilized for retail businesses, given the drastic need for healthcare and the lack of existing infrastructure in many rural places across the globe, we propose incorporating this model to improve healthcare access. Specifically, we propose the creation of a platform that mobilizes and trains the large population of unemployed youth in South Africa to become community health-workers and complete deliveries of chronic medicines from pharmacies to individual households. This model has the potential to not only make a large impact in improving healthcare outcomes but can also be financially sustainable and profitable if deployed correctly.
Background

Micro-Financing

Microfinance is a category of financial services targeting individuals and small businesses who lack access to conventional banking and related services (Caramela, 2018). It is a relatively new concept pioneered by Mohammed Yunus, founder of the Grameen Bank. Yunus has successfully melded capitalism with social responsibility to create the Grameen Bank, a microcredit institution committed to providing small amounts of working capital to the poor for self-employment. From its origins as an action-research project in 1976, Grameen Bank has grown to provide collateral-free loans to 7.5 million clients in more than 82,072 villages in Bangladesh and 97% of whom are women. Over the last two decades, Grameen Bank has loaned out over 6.5 billion dollars to the poorest of the poor, while maintaining a repayment rate consistently above 98%. (Grameen Foundation) Since its inception, Microfinance has grown to a global phenomenon implemented worldwide.

Microfinance institutions rely on the sustainability of a business model that requires having and maintaining working capital in order to cover upfront costs prior to making revenue. Their success is contingent upon their clients utilizing their loans to generate enough revenue to pay back their loans with interest. With microfinance’s growth has come multiple issues with its inherent makeup. (Boateng and Poku, 2019) For one, it relies on providing loans to the world’s most disparate without having any guarantee that the loan will be repaid given that many of these individuals have no collateral to provide in return. (Boateng and Poku, 2019) Given this is the case, many MFIs charge enormously high interest rates to compensate for the inevitably high
default rate. However, this creates a self-fulfilling prophecy in which individuals never have any chance of repaying their loans as the interest rates associated with them are entirely unreasonable and much above what would be charged on a normal loan. (Banerjee and Duflo, 2016) In addition, given that the individuals who receive these loans are typically surviving on a day-to-day basis, any unexpected complications may mean that money they initially intended to invest in a business or asset, they must instead use for consumption.

MFIs across the globe have taken many approaches to tackling these issues. A study investigating Village Welfare Society (VWS) an MFI operating in West Bengal, India, found that social interactions among loan recipients increased loan repayment as individuals realized there were others undergoing the same struggles and worked together to find ways to stay on track. (Feinberg 2010) In addition, evidence from a firm-level panel data set of an Indian judicial reform which increased banks’ ability to recover non-performing loans in the 1990s, found that MFIs who have the capabilities to constantly follow up with their customers to ensure they are on-track, along with longer payback periods and definitive sources of revenue that are easily securable help in loan recovery. (Visaria, 2009) Another research study looking at Spadana, one of the most successful microfinance institutions in the world, not only in terms of return but also scale, showed that loans to individuals with a company or individuals seeking to start a company significantly improve their livelihoods and lifelong income, however loans to individuals not in these categories do not significantly improve quality of living. (Banerjee and Duflo 2009)

While microfinance for entrepreneurs in developing countries holds lots of promise in uplifting the global South, there are many challenges that must be overcome. For one, entrepreneurs without the right guidance can be led astray as they simply do not have the expertise necessary to run a profitable business. (Banerjee and Duflo, 2009). A study conducted
on microfinance in Indonesia showed that providing entrepreneurs with educational programs on how to start a successful business along with financial security lessons resulted in significantly lower rates of default on loans. (Hadi et. Al, 2015) A recent study that investigated aggregate MFI performance across the globe found that increasing transparency about pricing and warning customers about the difficulties associated with paying back in a time efficient manner drastically increased adherence to loan schedules and decreased default rates. (Arguelo, 2013) A study that evaluated Amanah Ikthiar Malaysia (AIM), Malaysia’s leading microfinance institution, randomly sampled 100 entrepreneur loan recipients and found that those who had a business prior to applying for the loan and those who were given longer periods of time to repay the loan had higher success rates of repayment as well as business performance.(Terano, 2015)

**Microfinance as a Distribution Strategy**

Many developing countries face transportation issues due to large disparities in infrastructure between urban and rural regions. Many of the world’s poor people live in rural areas isolated by distance, terrain and poverty from employment and economic opportunities, markets, healthcare and education. Lack of basic infrastructure (paths, trails, bridges and roads) and access to transport services makes it difficult for poor people to access markets and services.

This problem manifests itself in distribution issues. “In developing countries, the distribution infrastructure is inadequate and formal distribution channels do not reach most consumers unlike in developed countries with large retailers and their supply chains. As such, a social enterprise or a company can use micro-entrepreneurs to distribute finished goods in order to overcome the high cost of ‘last-mile’ distribution. Developing distribution strategies that entail micro-entrepreneurs are essential for poverty alleviation.” (Sodhi, 2016)
Many such strategies have already been deployed by companies across the globe. Mozambique-based VidaGas uses micro-entrepreneurs to sell propane gas to food-stall owners, fishermen and health clinics. (Sodhi, 2016) Vision Spring sells affordable reading glasses to low-income individuals through a network of micro-entrepreneurs in various developing countries (Sodhi, 2016). In East Africa, Coca-Cola bottlers deliver over $500 million worth of product to 1800 “manual” distribution centers operated by 7500 micro-entrepreneurs. (Sodhi, 2016) In 2000, Hindustan Unilever, a subsidiary of Unilever in India, started Project Shakti in 50 villages with woman-entrepreneurs receiving training and stocks of consumer-packaged goods from Unilever’s rural distributor to sell the goods to consumers and micro-retailers in 6–10 villages. (Sodhi, 2016)

Unfortunately, working capital is often the main bottleneck for such ‘Business of People’ companies. Many financial institutions do not lend to such micro-entrepreneurs because they are viewed as risky borrowers with insufficient collaterals. (Basarakegar, 2009) However, there are other potential financing options that may be feasible. For instance, companies can offer microfinance as working capital for the poor as suppliers or distributors, e.g., by pre-paying for supplies from the poor. Collection costs could be reduced because collection can piggy-back on the transfer of goods. Lending transaction costs are greatly reduced if micro-lending is tied to the actual transaction. A company could lend to farmers before the sowing season and gets its money back at harvest time when buying from the farmer. (Sodhi 2016)

Companies like Coca-Cola act as pseudo-financing institutions, providing individuals living in ‘delivery zones’ the opportunity to receive delivery motorcycles with zero-interest loans and sometimes even providing these individuals with additional loans to help them start entire delivery businesses. (Niewoudt)
CocaCola is taking their mission a step further through the 5by20 initiative they have started in South Africa along with a few nations in East Africa. The initiative provides training and educational programs for women seeking to become entrepreneurs. At the end of these programs, Coca-Cola often provides upfront capital for these women to start their own businesses, ranging from restaurants to bookkeeping. Average business sales increased 44% and data indicates average personal income increased 23% over one year. (Coca-Cola, 2015) More than half (54%) of participants reported their business improved ‘a lot’ as a result of the training. Of those women reporting their business improved ‘a lot’, more than half saw an increase in personal income. (Coca-Cola, 2015) On average, women showed an increased ability to afford basic expenses for themselves and their family, such as school expenses for children’s education, medical visits, and clothing. (Coca-Cola, 2015) Approximately two-thirds of participants reported they were able to put money in savings each month. More than 90% of women included in the study said they were confident they will keep their business open and will be able to grow.

**Healthcare Distribution**

While distribution of commercial goods is an issue in the developing world, distribution of health care products such as medications is particularly pressing due to the direct impact it has on people’s lives. Healthcare access in developing countries is a severe problem due to insufficient healthcare providers and non-existent supply chain infrastructure. (Ambe 2012) Globally, over one billion people go their entire lives without ever seeing a healthcare worker. Further, a staggering four billion people lack access to essential medicines on a daily basis (Zarocostas, 2007). The problem lies in the misallocation of resources as well as inefficiencies in healthcare distribution. People living in rural communities do not receive nearly the same level
of care as their urban counterparts due to the distances they have to travel to their closest provider. (Ward et. al, 2014) For those living in isolated locations, there are no healthcare providers nearby. (Yadav et. al, 2018) Furthermore, given the typical economic conditions of these regions, patients simply do not have access to transportation.

In Papua New Guinea, 50% of potential attendances at local clinics are lost at a distance of 3.5 km. The situation is similar in many sub-Saharan African nations, attendance rates at a rural health center were found to halve every 3.2 km in Uganda and every 3.4 km in northern Nigeria. (Muller and Genton, 98)

**Healthcare Distribution in South Africa**

This problem is particularly evident in South Africa due to the disparity between urban and rural regions along with an overcrowded public healthcare system. The result is that patients in rural regions who live many kilometers away from their nearest healthcare facility are unable to access essential medicines. (Atula 2012) 15% of South Africans, or almost 9 million people, live more than 5KM away from their closest healthcare facility. (Mclaren, 2013) However, even this number does not tell the full story given that urban centers like Johannesburg and Capetown house millions of people and distort the statistics for those living outside of these well-resourced areas. 40% of communities have to travel an average of 25 km to get access to healthcare. (Ataguba 2018) Distance does not tell the whole story of the struggle in receiving healthcare. The majority of those living in rural South Africa do not own vehicles and are located in regions devoid of public transportation, making even a few kilometers seem impossible to surmount. In Kwazulu-Natal for instance, the average time to the closest healthcare provider was nearly four
hours. (Chimbindi et. al 2016) In addition, those who do make their way to a provider are typically met with long waiting times and no guarantee that their medication is available. 68% of patients spend between two to five hours waiting for a consultation with a doctor, depending on the facility. (Tanser, 2006)

Figure 1: South African Health Facilities Density per Population (Mokhele, 2012)

Figure 2: South African Health Facilities Density per 1000 KM² (Mokhele, 2012)
Hypothesis and Research Focus

Given the drastic need for healthcare and the lack of existing infrastructure, providing care directly to the household level is the most direct way to improve access. However, it is impossible to achieve this task without first increasing the workforce of healthcare workers and improving access to transportation in rural regions.

Proposed Platform

We propose the creation of a platform that mobilizes the large population of unemployed youth in South Africa to complete deliveries of chronic medicines from pharmacies to individual households. We do this by facilitating the provision of loans for these individuals to purchase scooters. However, rather than requiring these youth repay these loans directly, the platform instead reallocates a proportion of the income they generate from their deliveries towards the loan. The rest is for drivers to keep. This platform, termed Mobility, offers a solution to a distribution problem that necessitates thousands of small deliveries to be completed at once. It gives pharmacies a cost-effective way to gain access to a clientele that would otherwise be inaccessible. Additionally, it also aims to drastically increase medical adherence and outcomes by not requiring any additional commitment from the patient outside of picking up their medicines from their doorstep.

Most importantly, it does this by taking unemployed, underutilized individuals, training them to become community health workers, providing them with means of transportation and deploying them to act as nodes of care in their local communities. Even beyond their
commitment to *Mobility*, these workers now have the skills needed to make a tangible impact in their communities by providing essential health services and education to those who need it.

![Diagram](image)

*Figure 3: Mobility Training Channel*

**Micro-Financing Model**

*Mobility* uses its microfinancing model to generate the workforce that drives its mission. As opposed to traditional ride-sharing models that take pre-existing drivers who have the time and willingness to complete deliveries for money, *Mobility* seeks to create drivers and micro-entrepreneurs in communities devoid of distribution networks. *Mobility* hires unemployed individuals and trains them to become Community Health Workers, providing them with knowledge regarding handling medications and answering basic medical questions. After the training program, Mobility provides these individuals with scooters without any initial capital needed on their part. It does this by facilitating the provision of microfinance loans for these individuals. Once the individual has a vehicle, they are free to use it however they would like asides from a certain number of required deliveries they must complete in order to make significant progress towards repaying their loan. Once the loan has been paid off completely, they are now free to use the scooters in any way they choose and no longer have any financial commitment to *Mobility*. They are also now certified community health workers, own an asset in the form of a scooter, have an established credit history and can now pursue opportunities within the healthcare field, further pursue their educations and contribute to the well-being of their communities.
Figure 4: Loaning Model

The Platform

The heart of *Mobility’s* delivery model lies within the software application that facilitates communication between the different players involved. The platform will consist of three distinct interfaces: pharmacy-facing, driver-facing, and patient-facing.

A. The pharmacy interface will allow pharmacists to receive notification of clients placing orders for prescribed medicines they would like delivered to them. From here, the pharmacist can request a delivery and notify the application when the package is ready to be picked up. Once the package has been retrieved by a driver, the pharmacist can track the progress of the delivery and will be notified once the package has been delivered to the patient’s home.
B. The driver interface, consisting solely of SMS-notification, allows for drivers to be notified when a delivery is available for them. Once a package has been retrieved, the driver receives directions to the customer’s address. Once the driver arrives at the desired location with the package, they are then prompted to verify the patient’s identity through a recipient-specific code present on the patient’s phone. After each delivery, a driver’s total income generated from *Mobility* is updated along with the progression of their scooter loan.

C. The patient interface keeps track of when patients take their chronic medicines and when they will need a refill based on their treatment regimen. Based on this tracking, the interface notifies the patient of an upcoming delivery via text-message and asks them to confirm the delivery request. Once confirmed, patients can track the delivery’s progress in real-time and will be notified when the driver has arrived. The platform will notify the patient when it is time for another dose as well as when it is time for them to check-in with a doctor in-person so that the chronic condition is adequately handled.

*Figure 5: Mobility Platform Diagram*
Research Question

While the provision of essential medicines and the empowerment of youth are great externalities to Mobility’s model, in order for Mobility to be sustainable, the services offered through the platform must be sold to a payer that has a willingness to spend large enough to cover the operating costs. In this case, the ideal payer would be the South African government and we will discuss why they would benefit from this platform as well as quantify their willingness to pay.

Thus, the primary question that this paper seeks to answer is: how sustainable is a healthcare distribution venture that generates its workforce through microfinance-centered education and loaning models?

This larger question can be broken-down into two-related questions:

1. Can this model be profitable in the long-term?
2. How does the default rate and profitability differ for this model as opposed to a traditional microfinance institution?
Methodology

The methodology for this paper can be divided into two components.

1) Analyzing the Viability of Scooter-Loaning Based Medical Delivery Model

To investigate the financial viability, we will explore the implementation of Mobility on a small-scale in a particular region of South Africa. Particularly, we will look at the Hlabisa Sub-district of the Kwazulu-Natal province. This region was chosen because of the sparsity in healthcare facilities, making it an ideal target for Mobility’s model. In addition, this region has been investigated through many papers thus there is strong, comprehensive information regarding healthcare outcomes and the need for various services. (Hontelez, 2016) We will explore a revenue model built upon the Kwazulu-Natal provincial government paying a fixed-annual contract in exchange for Mobility’s services. We will quantify the value added to the provincial government and use this to determine their willingness to pay. In addition, we will explore the costs associated with the implementation of Mobility in this region and determine the demand for the service being offered. The need for the service will be measured by chronic disease prevalence, geographic location and the health and convenience costs associated with not adhering to treatment regimens. Overall costs of the platform will include the cost of educating unemployed workers to become Community Health Workers, wages that need be paid, medicine mishandling costs, administrative expenses and incorporating the possibility of default from loan recipients. We will investigate various potential scenarios for revenue and cost and analyze these scenarios to determine whether or not this venture is financially feasible.
Study Area Demographics and Need

Hlabisa health sub-district is part of the rural district of Umkhanyakude in northern KwaZulu-Natal and is 438km² in size. (Hontelez, 2016) The population consists of approximately 228,000 Zulu-speaking people of which 3.3% are located in a formal urban township (KwaMsane), 19.9% in peri-urban areas and the remainder (76.8%) are classified as living in a rural area. 13 clinics provide the bulk of the health care in Hlabisa sub-district. (Kharasany, 2018)

Figure 6: Health Facilities in the Hlabisa-sub district.

The population-weighted HIV prevalence was 36.3%. The median travel time to the nearest clinic is 81 min and 65% of homesteads travel one hour or more to the nearest clinic. (Tanser, 2006) There was a significant logistic decline in usage with increasing travel time. The adjusted odds of a homestead within 30 min of a clinic making use of the clinics were 10 times those of a homestead in the 90–120 min zone. (Tanser, 2006) The average 50% of homesteads
situated 85 min from a particular clinic will attend that clinic. The distance estimate of this is 5.5 km. (Tanser, 2006)

Figure 7: Clinic Usage based on Travel Time

Quantifying the Economic Costs of Lack of Healthcare Access

The costs associated with lack of healthcare access are broken into two components. Firstly, we considered the cost associated with a patient not retrieving medications to the government. When individuals develop life-altering conditions like HIV and do not take ARTs or equivalent medicines, they are likely to develop long-term complications and require much more severe long-term care. The South African Department of Health has made both HIV care and treatment free of charge in public healthcare facilities to increase treatment accessibility. (Meyer-Rath, 2017) Thus, this lack of adherence is a direct cost to the government. To estimate this cost, we looked at the overall cost of HIV for the South African government.
We then specifically consider HBC (Hospital-based Care), HIV Treatment ND, and Palliative/hospice care SDC (step-down care) as costs that arise due to complications caused by lack of adherence to HIV. We consider the people on these treatment options to find the per person cost.

Secondly, while treatment in South Africa is free for the patient, previous research suggests that patients bear costs in both time and money. Data collected annually in the study area shows that the median time taken to travel to the nearest clinic is 81 minutes and the common mode of transport for most patients is by mini-bus taxis. (Tanser, 2006) These expenditures can lead to financial distress for patients already living in poverty. People may forgo essential services to pay for healthcare, borrow money from relatives, or friends; or resort to selling of assets, contributing to longer-term impoverishment. For HIV care and treatment specifically, time losses and out-of-pocket payments amount to very large sums, as treatment is life-long. Transport was the largest expense associated with clinic visits, with a monthly cost of 37R. (Tanser, 2006) 63% of ART used public transportation to and from the clinic. Food costs during the clinic visit also contributed to monthly expenditures associated with clinic visits: 9R.
None of the patients paid for medicines, and small amounts were reported to have been spent on childcare, overnight accommodation and cell phone airtime.

In order to determine the value added by Mobility we summed the costs of the distance disparity for the government, measured by the cost of non-adherence causing long-term complications and the costs for patients to travel to their closest healthcare provider. Once we determined the per patient cost per year, we looked at the average treatment regimen per year for HIV patients to determine the cost per missed pick-up. This is roughly equal to the value of a Mobility delivery and we assumed that, in exchange for this value add, Mobility would charge 50% of this number to the Hlabisa Municipal government to provide delivery services to their patients.

**Quantifying the economic costs associated of the Proposed Platform**

In order to determine the cost function for Mobility, we considered the expenses associated with purchasing scooters for drivers to service the 13 clinics located in the area. We also took into account administrative costs associated with hiring people to manage relation with clinics, software expenses and medicine mishandling costs. We assumed an average work week for drivers of 20 hours and determined wages by providing a 75% premium to the South African minimum wage. (Department of Health) We then determine capacity for the number of deliveries completed, by taking the median distance to the closest healthcare provider and scaling by 2 for a round trip. We took the average speed of a scooter to determine how many deliveries drivers could complete per week and also used this to determine the cost of gas. Based on this capacity as well as the demand, we determined how many drivers we should onboard for these 13 clinics.
2) Comparing our integrated microfinancing model with traditional microfinance

The second part of the research question requires exploring the value of this integrated form of microfinance against the traditional model. Many of the issues highlighted with microfinance are based in providing loans to individuals without stable sources of income, and thus, high interest rates to compensate for the higher likelihood of default. Through Mobility, those who receive loans are guaranteed a stable source of revenue through by able to deliver essential medications. In order to determine whether this hypothesis is accurate we utilize data from MixMarket.Org, an online database for aggregate information regarding thousands of Microfinance institutions across the globe and their financial performances. (World Bank, 2018) We look at three particular financial indicators, Write-Off Ratio, Portfolio at Risk after 30 days, and Profit margin. We first consider the average for these variables across all microfinance institutions. We then subset institutions based on 1. Whether they seek to grow businesses 2. Whether they solely provide loans for guaranteed income-generating projects 3. Whether they provide loans for microenterprises 4. Whether they provide education-related loans 5. Whether they mandate a savings account 6. Whether they provide enterprise-skills development in addition to their financial investment 7. Whether they provide health education in addition to their financial investment. All of these factors were chosen based on their connection to Mobility’s microfinancing model. We then independently determine the mean of the three financial performance indicators we had determined previously to see how MFIs with these isolated characteristics perform against the mean. This will provide insight into Mobility’s performance against other MFIs.
Findings

Part 1: The Economics of Mobility

Demand-Side Analysis

To begin, we determined what the demand for Mobility’s deliveries would be on an annual basis. To do this, we determined the number of people within this region that had HIV and were currently less than 50% likely to go to the closest clinic due to distance barriers. For the purpose of this analysis, we assumed those with greater than 50% likelihood of going to the clinic would go and those below this threshold would not. This provided the total population that could be serviced, and we assumed a market penetration rate of 20% to begin with to consider the impact of Mobility during its initial stages prior to ubiquitous adoption.

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Total Population</td>
<td>228,000</td>
</tr>
<tr>
<td>HIV Prevalence</td>
<td>36.3%</td>
</tr>
<tr>
<td>Population with HIV</td>
<td>82,764</td>
</tr>
<tr>
<td>Population with HIV who are less than 50% likely to use clinic</td>
<td>41,382</td>
</tr>
<tr>
<td>Average ART Regimen</td>
<td>4 Refills/Year</td>
</tr>
<tr>
<td>Total Market for Deliveries</td>
<td>165,528</td>
</tr>
</tbody>
</table>
Initial Penetration | 20%
---|---
Total Deliveries Completed/year | 33,106

Table 1: Total Market for Pharmacy-to-Home Deliveries in Hlabisa

Next, we determined the value of each delivery. To do this, we looked at the cost attributed to a particular patient not being able to access the pharmacy. We considered the costs to the government due to long-term complications caused as well as the total cost to the patient due to time and monetary costs of travelling to the clinic. To determine the non-adherence costs for the government we considered the total long-term complications costs associated with HIV in South African and scale this to determine the per person cost.

**Total Costs to Government Due to Non-Adherence**

| Total Costs due to Long-Term Complications for South African Government | 2,210,338,233 R |
| Number of People in SA with HIV | 7,700,000 R |
| Average Cost/Person | 287 R |
| **Average Cost/Dose** | **71.80 R** |

Table 2: Cost per dose due to non-adherence
Total Costs to Patients Due to Lack of Access

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Transportation Cost</td>
<td>37 R</td>
</tr>
<tr>
<td>Food Costs</td>
<td>9 R</td>
</tr>
<tr>
<td><strong>Total Costs/person</strong></td>
<td><strong>46 R</strong></td>
</tr>
</tbody>
</table>

*Table 3: Cost per dose for the patient*

Based on these calculated cost savings, we arrived at a total value per Delivery of 117.8 Rand. This is the value added to the Kwazulu-Natal provincial government per delivery of medicines completed by Mobility. In exchange for this value added, we estimate that Mobility would be able to charge half this amount as a per delivery fee that would be scaled by the number of deliveries per year to determine the cost of the annual contract charged to the government. In addition, there is the possibility of the patient bearing some of this cost due to the value added to them.

**Capacity per Driver**

Next, we determined the capacity for how many deliveries a Mobility driver could complete annually. We determined this by first approximating the average round trip distance per delivery at 11km based on the fact that the median distance to a pharmacy in this region is 5.5km. From here, we determined the average km/hour a scooter could drive at 50km/hr, incorporated a setup time per delivery and assumed a 20-hour work week for the drivers.
Round Trip Distance per delivery  
11 km

Avg km/hour on scooter  
50km/hr

Setup Time per Delivery  
15 minutes

Time per deliver  
28 minutes

Hours worked per week  
20

Deliveries/week/driver  
42

Deliveries/year/driver  
2,200

Drivers Needed  
15

*Table 4: Drivers Needed*

**Driver Wage Expenses**

Wages were determined by taking the South African minimum wage and scaling this value by 75% to provide a competitive, livable wage for our drivers.

<table>
<thead>
<tr>
<th>Hourly Wage</th>
<th>35 R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wage per year</td>
<td>36,400 R</td>
</tr>
<tr>
<td>Drivers</td>
<td>15</td>
</tr>
</tbody>
</table>
Table 5: Driver Wage Expenses

Capital & Administrative Costs

We determined the cost of scooters by looking at multiple different dealerships in South African and arriving at an average value. The wages for administrative staff members were determined by looking at the wages for similar positions in the Ministry of Health.

<table>
<thead>
<tr>
<th>Scooter Cost</th>
<th>15,000 R/scooter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Drivers</td>
<td>15</td>
</tr>
<tr>
<td>Total Scooter Costs</td>
<td>225,000</td>
</tr>
<tr>
<td>Wage per Administrative Staff</td>
<td>28,224R/year</td>
</tr>
<tr>
<td>Total Administrative Staff</td>
<td>7</td>
</tr>
<tr>
<td>Total Administrative Cost</td>
<td>197,568 R</td>
</tr>
<tr>
<td><strong>Total Capital + Administrative Costs</strong></td>
<td><strong>422,568 R</strong></td>
</tr>
</tbody>
</table>

Table 6: Capital & Administrative Costs
**Medicine Handling Costs**

We determined the total cost of all ARTs (Meyer-Rath, 2017) handled by drivers in a given year and assumed a 1% mishandling rate to arrive at the total costs associated with medicine mishandling.

<table>
<thead>
<tr>
<th>ART Costs</th>
<th>3300 R/person/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs/delivery</td>
<td>825 R</td>
</tr>
<tr>
<td>Deliveries/year</td>
<td>33,106</td>
</tr>
<tr>
<td>Total Costs</td>
<td>27,312,450 R</td>
</tr>
<tr>
<td>Mishandling Rate</td>
<td>1%</td>
</tr>
<tr>
<td>Medicine Mishandling Costs</td>
<td>273,125 R</td>
</tr>
</tbody>
</table>

*Table 7: Medicine Mishandling Costs*

**Revenue & Margin Analysis**

The revenue per delivery is calculated by charging 50% of the value added. The total costs are determined by summing wage expenses, capital & administrative costs and medicine mishandling expenses. This equates to a total profit of 511,561R and a profit margin of 36.4%.
Total Revenue

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Added/delivery</td>
<td>117.8 R</td>
</tr>
<tr>
<td>Amount/Delivery</td>
<td>58 R</td>
</tr>
<tr>
<td>Total Deliveries/year</td>
<td>33,106</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>1,953,254 R</td>
</tr>
</tbody>
</table>

*Table 8: Revenue*

Total Costs

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver Wage Expenses</td>
<td>546,000 R</td>
</tr>
<tr>
<td>Capital &amp; Administrative Costs</td>
<td>422,568 R</td>
</tr>
<tr>
<td>Medicine Mishandling Costs</td>
<td>273,125 R</td>
</tr>
<tr>
<td>Total Expenses</td>
<td>1,241,693 R</td>
</tr>
</tbody>
</table>

*Table 9: Expenses*

Profit & Margin Analysis

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit</td>
<td>711,561 R</td>
</tr>
<tr>
<td>Margin</td>
<td>36.4%</td>
</tr>
</tbody>
</table>

*Table 10: Margin Analysis*
Break-Even Analysis

While we have determined a price-point for the cost charged per delivery to the Kwazulu-Natal provincial government, this is based on an assumption of the percent of cost-savings they would be willing to pay for the platform. We will also determine the break-even price, or the lowest cost per delivery that Mobility could accept and still be sustainable. Any price above this point would allow for profitability.

Total Costs: 1,241,693 R
Total Deliveries: 33,000
Break-Even price per delivery: 37.63 R

Part 2: Microfinancing Analysis

We analyzed 3 key financial metrics: the write-off ratio, proportion of portfolio at risk after 30 days and the profit margin for a variety of different types of microfinance institutions. We did this in order to compare how MFIs with similar aspects to Mobility perform against the average.
<table>
<thead>
<tr>
<th>Financial Metrics</th>
<th>Write-off Ratio</th>
<th>Portfolio At Risk (30 days)</th>
<th>Profit Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>All MFIs</td>
<td>5.32%</td>
<td>6.41%</td>
<td>66.20%</td>
</tr>
<tr>
<td>MFIs focused on growing businesses</td>
<td>6.18%</td>
<td>6.22%</td>
<td>177.42%</td>
</tr>
<tr>
<td>MFIs only providing loans to income-generating individuals</td>
<td>5.43%</td>
<td>6.20%</td>
<td>115.99%</td>
</tr>
<tr>
<td>MFIs invested in ME</td>
<td>5.57%</td>
<td>6.16%</td>
<td>120.09%</td>
</tr>
<tr>
<td>MFIs Providing Education Loans</td>
<td>4.48%</td>
<td>7.12%</td>
<td>12.51%</td>
</tr>
<tr>
<td>MFIs Requiring Savings Account</td>
<td>3.73%</td>
<td>6.29%</td>
<td>-91.38%</td>
</tr>
<tr>
<td>MFIs Providing Entrepreneurship Skills</td>
<td>4.03%</td>
<td>5.77%</td>
<td>15.48%</td>
</tr>
<tr>
<td>MFIs Providing Health Education</td>
<td>2.07%</td>
<td>4.42%</td>
<td>14.91%</td>
</tr>
</tbody>
</table>

*Table 11: Comparing MFIs*
As shown by this analysis, MFIs that provide education loans, require savings accounts, provide entrepreneurship skills and/or provide health education have lower write-off ratios than the average MFI. Particularly significant is the drastically lower write-off ratio and Portfolio at Risk percent of MFIs that provide health education.
Figure 10: Comparing Profit Margin of MFIs

MFIs with high profit margins vary dramatically from the MFIs with low write-off ratios and default rates. In fact, the types of MFIs that had lower write-off ratios than the average MFI also have lower profit margins.
Discussion

Our analysis determines that an implementation of *Mobility* in the Hlabisa sub-district of Kwazulu-Natal would result in a profit of 511,561R and a profit margin of 36.4%. Break-even analysis shows that charging a price of 38R per delivery would result in sustainability and any price-point above this would result in profitability. *Mobility’s* revenue is generated through charging the Kwazulu-Natal provincial government a proportion of the cost-savings attributed to higher adherence to medication in the form of an annual contract. We calculated this cost through determining the costs per patient related to more extensive care if they do not adhere to their initial treatment regimen. This analysis likely underestimates not only the total cost of non-adherence but also the total patient base for *Mobility’s* system. Firstly, all calculations were done for HIV. While HIV is the most common chronic condition in not only the Hlabisa sub-district but all of South Africa, there are many other chronic diseases, such as tuberculosis and diabetes, that also place a significant toll on South Africa’s healthcare system. Including all chronic diseases, along with patients with comorbidities would increase the patient base served by *Mobility*. Secondly, our calculations for the costs attributed to the government due to non-adherence underestimate the total cost. This is because while we account for the cost for more severe complications, we do not account for the economic costs of morbidity and a more unproductive workforce. In addition, we assume that there would be no patient contribution to this deliver fee given many people receiving the service are impoverished and may not have the means to pay. However, given the significant value proposition of *Mobility* to these patients, it might be reasonable to charge a small patient fee as well. Regardless, even with these
conservative estimates, we project profitability for Mobility based on the assumptions and data we analyzed for the Hlabisa sub-district of Kwazulu-Natal.

Our analysis for various types of microfinance institutions show that MFIs that provide education loans, require savings accounts, provide entrepreneurship skills and/or provide health education have lower write-off ratios than the average MFI. MFIs with high profit margins vary dramatically from the MFIs with low write-off ratios and default rates. In fact, the types of MFIs that had lower write-off ratios than the average MFI also have lower profit margins. MFIs focused on growing businesses, only providing loans to income-generating individuals, and those that invested in microentrepreneurs have significantly higher profit-margins but also higher write-off ratios. A potential explanation could be that MFIs with high rates of default charge higher interest rates to compensate which allows for higher profit margins. In addition, it appears that the MFIs with lower default rates place more of an emphasis on providing additional services to their clients outside of solely capital, thus denoting that they place a large emphasis on their client’s future rather than solely financial gain. Mobility seeks to strike a balance between the two: achieving both large societal impact as well as financial profitability.
Conclusion

Healthcare access is one of the most pressing issues that rural populations across the globe face. This challenge is particularly large in South Africa due to the disparity in resources between urban and rural areas, geographical barriers, and sparsity of healthcare facilities. Mobility’s model provides a potential solution through the deployment of an underutilized workforce to provide care directly to patients’ homes. As opposed to typical microfinance, Mobility ensures that those receiving a loan have a stable source of revenue to eventually repay the loan and make a sizeable living for themselves.

While the work done in this paper analyzes the theoretical feasibility of a microfinance-based healthcare distribution network, in order to truly determine its efficacy, the platform must be tested on-the-ground. To that extent, the immediate next steps involve designing and implementing a small-scale pilot study to be implemented in the Hlabisa sub-district or a similar location where Mobility could be helpful in providing medicines to the local population. This pilot will have to incorporate the economic, but also the logistical, cultural and social challenges with the platform. In theory, Mobility’s value proposition is clear, but in practice, relevant stakeholders may hesitate to immediately understand the value. Conducting a pilot study will help resolve some of the question marks currently present, including the government’s willingness to pay for this service, the ease by which patients and community health workers can access the platform, the unit economics and the regulatory hurdles.

Overall, Mobility’s model has the potential to improve healthcare access through the creation of entire distribution networks of community health workers, however, further research must be conducted to determine the practical feasibility of the system prior to it being scaled more broadly.
References


Lilienfeld-Toal , Ulf von. e Distributive Impact of Reforms in Credit Enforcement: Evidence from Indian Debt Recovery Tribunals.


