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# Strategic Program for Analyzing Complexity and Evaluating Systems (SPACES)

# Zambia Cross-Border Health Seeking Behavior

**February 2019**

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# ZAMBIA CROSS-BORDER HEALTH SEEKING BEHAVIOR

# STRATEGIC PROGRAM FOR ANALYZING COMPLEXITY AND EVALUATING SYSTEMS

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From February – August 2018, the Strategic Program for Analyzing Complexity and Evaluating Systems (SPACES) Monitoring, Evaluation, Research and Learning Innovations Program (MERLIN) Consortium utilized its suite of systems tools to assist the Zambian Ministry of Health (MOH) to identify geographic areas where cross-border population in-flows and out-flows influence health service delivery and commodity consumption and the extent to which this phenomenon occurs.

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## ACRONYM LIST

| | |
|---|---|
| AIDS | Acquired Immune Deficiency Syndrome |
| ART | Anti-Retroviral Therapy |
| CBU | Cross Border Utilization (measured by number of patients) |
| CHWs | Community Health Workers |
| CSO | Central Statistics Office |
| DHD | District Health Director |
| DMO | District Medical Officer |
| DRC | Democratic Republic of the Congo |
| FY | Fiscal Year |
| HIV | Human Immunodeficiency Virus |
| HRH | Human Resources for Health |
| IOM | International Organization for Migration |
| GRZ | Government of the Republic of Zambia |
| GPW | Gridded Population of the World (Version 4) |
| GOPC | Global Obesity Prevention Center |
| MERLIN | Monitoring, Evaluation, Research and Learning Innovations Program |
| MCH | Maternal and Child Health |
| MOH | Ministry of Health |
| OOP | Out-off Pocket |
| SIGMA ` | Strategic Integrated Geo-Temporal Mapping Application |
| SPACES | Strategic Program for Analyzing Complexity and Evaluating Systems |
| TB | Tuberculosis |
| USAID | United States Agency for International Development |
| UNAIDS | Joint United Nations Programme on HIV and AIDS |
| UNHRC | United Nations Human Rights Commission |
| ZAMPHIA | Zambia Population-Based HIV Impact Assessment |
| ZMW | Zambian Kwacha |

# INTRODUCTION

The purpose of this study is to assist the Zambian Ministry of Health (MOH) to pinpoint geographic areas where cross-border population in-flows and out-flows are influencing health service delivery and commodity consumption and the extent to which this phenomenon occurs. This information is intended to guide MOH's budgeting and planning for affected border districts and specific facilities that are most impacted.

Planning and ordering of health commodities and supplies in Zambia is done at the central level and is based on the estimated district's population catchment area. As is often the case, in-transit or non-Zambian health-care seekers are often unaccounted for in this population-based measure. Thus, health commodity supply and demand forecasting for border regions on the basis of catchment area prove difficult and often inaccurate.

In addition, this study will assist in the development of scenarios to estimate the impact of various factors on the flow of health seekers into Zambia from bordering countries. The study aims to:

1. Provide insight into the current situation regarding cross-border health seeking behavior, including geographic analysis, services and commodities;
2. Describe what factors are driving cross-border health seeking behavior and explore what events may or may not influence health seeking behavior;
3. Inform potential scenarios that could impact cross-border health seeking behavior and explore how these scenarios can be planned and budgeted for;
4. Inform policy measures and other actions that might be taken by the Government of the Republic of Zambia (GRZ), MOH, donors and other actors to mitigate the impacts of cross-border health seeking, keeping in mind core public health considerations.

The first half of the report provides findings from the field-based study, which is focused on understanding the driving factors and events that may influence health seeking behavior. This includes the factors driving health seeking behavior, the events that may or may not influence health seeking behavior and health seeking behavior under various scenarios. The second half of the report focuses on quantifying border-crossing in different locations and under different circumstances using systems mapping and modeling techniques.

# IN-COUNTRY FIELDWORK

## Methodology

The research design of this study is qualitative in nature and is guided by both primary and secondary data analysis. This research relies on information gathered as result of a literature review and as well as conversations with key stakeholders to the Zambian health system.

*Literature Review:* At the time of this study, no information currently existed in a publicly available format that directly addresses the topic of cross-border health seeking behavior in Zambia[1]. However, secondary research did reveal several factors for consideration in determining how, when, and why people may choose to cross borders, including a variety of social and political drivers. These factors were tested via the field-based survey instrument.

*Site Selection:* The SPACES team sought to verify exactly which factors are driving the cross-border health seeking behavior in Zambia by visiting four different border districts: Chililabombwe, Nakonde, Chienge, and Chirundu. These districts were selected based on guidance from the Ministry of Health (MOH).

*Field-Based Data Collection:* Two members of the SPACES team along with a local interlocuter visited the four border districts named above and spoke with key stakeholders. Key stakeholders were limited to healthcare practitioners, government officials, and other Zambians with knowledge of the healthcare system. Due to health sensitivity concerns, health seekers were not interviewed. The team acknowledges the limitations of relying on secondhand information for the purposes of understanding the motivations of cross-border healthcare seekers.

To understand the primary factors and events that may influence cross-border health seeking behavior, in-depth qualitative interviews were conducted at national, government funded health facilities in the four selected border districts between May 22, 2018 and June 5, 2018. The interviews conducted aimed to answer the following research questions:

1. What is the current situation regarding cross-border health seeking behavior, including geographic analysis, services and commodities?
2. What factors are driving health seeking behavior?
3. What events may or may not influence health seeking behavior?
4. What are potential future scenarios that may influence health seeking behavior, and how can they be best planned and budgeted for?
5. What policy measures and other actions might be taken by the GRZ, MOH, donors and other actors to mitigate the impacts of cross-border health seeking, keeping in mind core public health considerations?

Specific health facilities (n=19) were selected in collaboration with MOH and the respective District Health Offices and only Zambian health providers and other key stakeholders (n=70), including District Health Officials, community volunteers, and other facility staff, were interviewed who have direct knowledge of cross-border health seeking behavior. All but one of the facilities included in this study are nationally-funded government facilities[2]. Facility types ranging from health posts to Level I hospitals were selected

[1] International Organization for Migration (IOM) Strategy. *A Rapid Assessment of Access to Health Care at Selected One Stop Border Posts (OSBP) in East Africa.* Nairobi, Kenya: IOM, 2013.
[2] See Appendix 3 for a list of facilities included in this research

for inclusion in this study. Level 2 and 3 hospitals were not included as there were none located in the areas included as part of the study.

**Facility Types in Zambia**

**Level 3 Hospitals:** Serve catchment population of at least 800,000; act as a referral centers for level 2 hospitals, and offer specially subservices in internal medicine, surgery, pediatrics, obstetrics and gynecology, intensive care, psychiatry, and research

**Level 2 Hospitals:** Serve catchment population between 200,000 and 800,000; act as referral centers for level 1 hospitals; and offer services in internal medicines, general surgery, pediatrics, obstetrics and gynecology, intensive care, psychiatry, and dental care.

**Level 1 Hospitals:** Also known as district hospitals, these hospitals are intended to serve catchment populations between 80,000-200,00; support all referrals from health centers; and offer general medical, surgical, obstetrics and gynecology, intensive care, psychiatry, and dental care.

**Health Centers:** Serve as primary care centers, with urban health centers serving catchment populations between 30,000 and 50,000 and rural health centers serving catchment areas of approximately 10,000 people or a radius of 29 kilometers.

**Health Posts:** These facilities are intended to operate as basic health centers for sparsely populated areas, with rural health post servicing populations of approximately 3,500 people (500 households) and urban health post serving populations of approximately 7,000 people (1,000 households). The type of health facilities offered at health posts are basic first aid rather than curative.

Source: Institute for Health Metrics and Evaluation (IHME). *Assessing Facility Capacity, Cost of Care, and Patient Perspectives, Seattle, WA; IHME 2014.*

*Survey Instrument*: The survey instrument ("Interview Guide") used in the field can be found in Appendix 2. This guide served to structure conversations to gather information from healthcare providers at facilities within the border districts. The team used this guide to capture drivers of cross-border health seeking behavior using three methods. First, the study's participants were asked to take part in a 45-minute qualitative interview[3]; interviews followed a semi-structured format and were conducted in the conducted in the language most comfortable for the participant (English/Bemba)[4].

- Raw Mentions: Interview questions were designed to organically elicit information regarding each stakeholder's understanding of the key factors that influence foreign patients to seek medical treatment in Zambia. The team recorded raw mentions of drivers during the preliminary semi-structured discussion. Semi-structured discussions were conducted with anywhere from 1-4 key informants at a time.
- Binary Choice: At the end of the semi-structured discussion, key informants were asked to individually review a list of potential drivers of cross-border health seeking behavior. This list was derived from the literature review. Based on their individual experience, key informants were asked to indicate which factors they believed to be a driver. Factors that were deemed to be a driver were indicated with an "X". Factors that were not considered to be a driver were left blank.

[3] See Appendix 1 for the interview consent form.
[4] Bemba is a local Zambian language primarily spoken in north-eastern Zambia.

- Factor Ranking: Finally, each key informant was asked to rank the top three reasons non-Zambians seek healthcare at their facility[5]. Thematic analysis was used to extract the drivers of health seeking behavior.

During the last two exercises, each key informant was supported by a member of the research team who was available to answer clarifying questions, and who recorded the respondent's choices.

To determine the importance placed on factors by the interviewees, a weighting scheme was created, whereby factors that were both organically mentioned and ranked as the top three drivers, were weighted more heavily and considered more critical to understanding why foreigners cross into Zambia to access healthcare and commodities.

### *Limitations*

Limitations to this study exist and must be considered. First, and the perhaps most important limitation, is the key informant boundary set by the study. The inability to directly interview health seekers inevitably limits the study's understanding of cross-border health seeking behavior. Relying extensively on the knowledge of healthcare providers places significant emphasis on health provision, thereby de-emphasizing other relevant drivers of cross-border health seeking behavior, such as geographic proximity and other social and economic barriers. Second, apart from the four districts that team visited, there are other districts that experience a high volume of immigrants crossing into Zambia (i.e. Livingstone, Chipata) to access health services. The data collected may not be easily generalized to other border districts in Zambia as each district exhibits different driving forces of cross-border health migration. Third, most interviews were transcribed manually using pen and paper. Nuances may have been missed and/or statements may have been inaccurately transcribed.

[5] See Appendix 2 for a full copy of the interview guide.

## Summary of Key Driving Factors

Below is a summary of the key factors ranked in order of magnitude, based on potential to drive healthcare seekers into Zambia from bordering countries according to respondents. The rank order relates to the magnitude of impact that a particular factor is likely to have on the number of healthcare seekers coming to Zambia. Detailed information regarding active factors in each district are discussed in the following sections.

| Note: X indicates currently an active issue | | Chililabombwe | Nakonde | Chienge | Chirundu | |
|---|---|---|---|---|---|---|
| **Rank** | **Descriptor** | | | | | **Notes** |
| 1 | Political conflict or rumor of political conflict | X | | X | | Currently affecting DRC border, previously affected Zimbabwe border. Conflict or rumor-of conflict in Tanzania or any other bordering nation would drive healthcare seekers into Zambia . |
| 2 | An outbreak occurs (e.g. cholera, etc.) | | | | | Informants mentioned Malaria and Cholera outbreaks. An outbreak would dramatically increase the number of health seekers crossing into Zambia. |
| 3 | It is easy to cross the border | X | X | X | X | Closing a border, or reducing the hours or days per week it is open would have a dramatic impact in Chililabombwe, and Chienge. In Nakonde there is little/no border control currently. However, if border security were put in place this would likely decrease the number of healthcare seekers. In Chirundu a geographic barrier keeps people from crossing the border. |
| 4 | Care is free/cheaper compared to border country | X | X | X | | If cost of care became more expensive in Zambia as compared to the bordering country there would be fewer healthcare seekers coming into Zambia. |
| 5 | I live or work near the border | X | X | X | | Accounts for day traders near the border as well as those who are in-transit, likely waiting in their trucks near the border. |
| 6 | Services/commodities are available in Zambia that aren't available in bordering country | X | X | X | X | This is causes people to travel further, drawing people from bordering countries who live further away from the border. |
| 7 | Trust in Zambian healthcare (quality) | X | X | X | X | There is a perception of higher quality of care and friendliness of Zambian healthcare providers. Changes in perception would impact the flow of healthcare seekers into Zambia. |
| 8 | Safety concerns (e.g. when traveling to facility in bordering country) | X | | X | | This is related to conflict/rumor of conflict. Some informants mentioned that they will travel further if they feel safer going into Zambia. |
| Other factors to consider (lower weight) | | | | | | |
| | HIV Anonymity | | X | | | Some healthcare seekers prefer to receive treatment outside of their home community to maintain anonymity. |
| | Seasonal | | | X | | The most notable seasonal influx mentioned was the fishing season in Chienge which increases incidences of Malaria. |
| | Healthcare campaigns | | | X | | When campaigns are conducted near the border (on either side, not just Zambia) the number of visits from cross-border healthcare seekers increases. |

## Snapshots by District

The following section of the report will detail the cross-border seeking behavior patterns observed across four districts: Chililabombwe, Nakonde, Chienge, and Chirundu. The section will explore the respective impact that non-Zambian patients accessing services in Zambia place on national facilities and medical resources and commodities. Additionally, ways to mitigate negative impact on the Zambian healthcare system will be addressed.


*In-depth qualitative interviews (n=70) were conducted at health facilities in the four border districts of Chililabombwe (n=5), Nakonde (n=6), Chienge (n=4), and Chirundu (n=5)*

## Chililabombwe

A small district in the northern Copperbelt Province of Zambia, Chililabombwe is located approximately 20 kilometers from the border of Democratic Republic of the Congo (DRC). Given its close proximity to the border, the key informants interviewed (n=19) at the district health facilities visited (n=5) report that a steady number of Congolese nationals cross the border to seek health services in Zambia. Border crossing for those coming from DRC is relatively simple as day passes can be easily obtained at border checkpoints. Most come just across Kasumbalesa, the border town just across in the DRC, and do not travel long distances to visit a Zambian facility. While the district serves a population catchment area of approximately 125,194, the exact numbers of foreign patients accessing services in Chililabombwe is difficult to estimate. While health services are always reportedly rendered regardless of nationality, patients often attempt to hide their nationality out of fear of being denied access to medical services, further complicating approximation figures.

The majority of the non-Zambian patients served in Chililabombwe, are in-transit, usually day traders, migrant workers or truck drivers, who happen to fall ill and need medical attention while in the area. Due to its proximity (~1 km) to the border, Kasumbalesa Urban Health Center serves as the facility of choice for many of the Congolese patients in-transit, as many spend a significant amount of time, sometimes weeks, awaiting to clear their goods across the border. The typical medical services sought by these in-transit patients vary, though the majority of facilities interviewed reported anti-retroviral therapy (ART), malaria, and tuberculosis (TB) treatment as the primary services sought at the Chililabombwe health facilities.

However, there is cross-border health seeking migration flowing both ways. Key informant interviews indicate that some Zambians are crossing from Zambia into the DRC to access medication. Prescription medications can be readily found at a low cost at local Congolese markets and can be purchased at unregulated quantities without prescription or doctor's guidance. However, as a result of the alleged unregulated nature of some Congolese pharmacies and alleged sub-standard quality of care across the border, cases of drug-related complications have been reported.

### *Key Driving Forces*

The Zambian border with the DRC is porous. The ease of crossing coupled with the proximity to safe, affordable and quality care draws Congolese and in-transit populations into Zambia. Personal relationships and intermarriages between Zambians and Congolese further contribute to the large number of non-Zambians treated in Zambian facilities, as many prefer to bring loved ones to Zambia. According to the key stakeholders interviewed, Congolese patients cross into Zambia because they are unable to access and/or afford the cost of basic health care services and medicines in the DRC. Additionally, many mothers cross into Chililabombwe so that their baby may be born in Zambia. Assuring their baby's Zambian nationality allows their child the right to free healthcare, Zambian education, and land acquisition rights.

*Nurses at Kasumbalesa Health Center work to verify health data sent to the District Health Office (DHO).*

The majority of facilities near the border in DRC are private for-profit facilities that are reportedly expensive. While the research team was unable to obtain a reliable estimate of the cost of care in Congo, key informants indicate that the out-of-pocket (OOP) costs and fees are prohibitive for many, especially the poor and most marginalized patients. Direct payment is often requested upfront and for every intervention, treatment or prescription. Given that Zambia's national healthcare system is free and largely subsidized by the government, it is unsurprising that many Congolese cross into Chililabombwe to access health services and medications.

Additionally, many Congolese cross the border to access basic medicines and treatments in Zambia. Key informants indicate that lines of treatment, especially for TB, are different in Congo and that medicines prescribed are often substandard or expired. Lack of trust in both Congolese health providers and the quality of services and medicines prescribed have forced many to seek care elsewhere. Congolese patients reportedly feel safer and more comfortable seeking care in Zambia where Zambian facility staff is perceived as hospitable and friendly.

Physical safety and security are other key factors driving Congolese patients into Zambia. Instability and a sense of lawlessness across the border due to the ongoing conflict, have caused many to flee DRC or settle into the far bush regions. In these rural, un-developed parts of the country, there is limited access to health facilities. Furthermore, access to facilities is encumbered by long distances and poor infrastructure. For many, facilities in Chililabombwe are the closest and most convenient.

### *Impact on Health Facilities*

Routine stock-outs of medical supplies and essential medicines were reported at each facility visited in Chililabombwe. Facilities attributed this to the unaccounted foreign population that they technically serve, but which is not accounted for in their central headcount.

Key informants indicate that this negatively impacts their ability to administer effective and quality service to patients. Serving non-Zambian patients is also placing a significant strain on health facility workers.

Facility staff reported staff shortages, overworked personnel and crowded wards, and long waiting lines all factors that are contributing to poor population health outcomes.

## Nakonde

Nakonde is located in the northwestern Muchinga Provence of Zambia and is approximately 8 km from the Tanzanian border. Given its close proximity to the border, the key informants interviewed (n=13) district health facilities interviewed (n= 5) report that primarily Tanzanian nationals cross the border to seek health services in Zambia, though a very small percentage of Malawian patients are also served.

Similar to Chililabombwe, the Tanzanian/Zambian border is porous. Cross-border adoption of language and culture further integrates the border community. Most Tanzanians from just across the border are fluent in the local language. Therefore, healthcare providers are often unable to distinguish between Zambian and Tanzanian patients. This makes the approximation of foreigners treated difficult to estimate. The border is open for approximately 12 hours a day and a passport is often not required to enter the country. The border runs through pedestrian roads and homes, making border crossing simple, unremarkable, and often unnoticed by both Zambians and Tanzanians alike.The facilities interviewed reported to treat some "in-transit" patients, temporarily in Zambia for business, the majority of non-Zambian patients that they serve do not specifically cross into Zambia to seek healthcare in Nakonde. Most come from just across the border and do not travel long distances to reach a facility, many travel by foot or motorbike. The typical medical services sought by these patients vary, though the majority of facilities interviewed reported anti-retroviral therapy (ART), malaria, and maternal and child health (MCH) services as the primary care needs sought.


*Nurse registers patients at the Nakonde Urban Health Center*

Interestingly, key informants indicate that a significant amount of facilities also serve a considerable number of patients from other parts of Zambia. This is of particular importance as these patients fall outside of the facility's catchment area and are not included in central statistical planning and budgeting. This "third" and an unaccounted-for population served places a significant burden on facilities' personnel and medical supplies. Several facilities reported that this non-local Zambian population places a significantly higher burden on health service delivery and commodities than the foreign population treated.

Similar to the phenomenon observed in Chililabombwe, key informants also indicate that a small number of Zambian patients choose to cross into Tanzania to purchase medication to avoid long waiting lines. Because a doctor's prescription is often not required, many Zambians are able to easily acquire

medications from Tanzanian pharmacies. Many Zambians believe that services rendered, and medications procured would be of better quality if they were required to pay for them. To complicate matters, inconsistent medical lines of treatment and drugs prescribed between Zambian and Tanzanian providers have been reported. This further contributes to drug regulatory issues and results in drug-related complications.

### *Key Driving Forces*


*Patients wait outside of Nakonde's Urban Maternity Center*

Zambia's free and comparatively higher quality of care drive both Tanzanians and Malawians into Nakonde for health care services. Unlike Zambia, both neighboring countries have a fee-for-services payment model in place. Reliable insight into the actual cost of services and medication at facilities across the border was not obtained during the interviews, though several interviewees hinted at general high costs, claiming that patients had to pay for every service rendered and that prescriptions could range from 40 to 50 Zambian Kwachas (ZMW). While Tanzanian government facilities across the border exist, they are far from border communities, and are reportedly congested, poorly staffed and lack the ability to efficiently and adequately deliver health services. Private facilities are present near the border but are outside of the financial reach of most. As a result, poor and marginalized groups who lack the financial resources to access private services often forgo or delay necessary care and treatment.

Hospitality and general trust in Zambian health providers was yet another pull factor. Many foreigners cross into Nakonde to seek healthcare because they believe that they would be better tended to and cared for if treated at a Zambian facility. According to interviewees, Tanzanian patients lack trust in their local health providers and feel safer accessing care abroad. The reported tendency to erroneously diagnosis and prescribe treatment and medication without proper medical evaluation and diagnosis further compounds this issue and sows fears and mistrust.

Many foreign patients cross into Nakonde because of interpersonal relationships. Intermarriages between Zambians, Tanzanians and Malawians further encourage movement across the border. In particular, many women choose to cross the border and seek MCH services in Zambia or are brought to Zambia by their partners. Facilities report that Tanzanian mothers try to specifically deliver in Nakonde, primarily for the free care and better-quality pre and post-natal services that they receive.

Lastly, many HIV positive foreign patients seek treatment in Nakonde in hopes of preserving a sense of anonymity. Positive patients often prefer and feel more comfortable accessing screening and treatment across the border where they can avoid local community judgement, stigma and social exclusion. Facilities interviewed report that this sentiment is primarily observed among the in-transit trucking population and commercial sex workers. Cases have been reported of HIV positive patients specifically making the effort to cross and seek health services in Nakonde out of fear of discrimination. However, it was also reported

that many Zambians cross the border to seek HIV treatment abroad and away from their home communities to maintain anonymity.

### *Impact on Health Facilities*

As observed in Chililabombwe, the extra population seeking treatment at facilities in Nakonde, whether foreign or non-local Zambian, places a significant burden on health resources and commodities. More significantly, it contributes to the regular commodity stock-outs observed by every facility interviewed. According to interviewees, stock-outs of antivirals, antibiotics and essential medications are experienced on a nearly monthly basis. While most facilities interviewed report that they order medical supplies and medications based on previous months consumption rates and demand, they acknowledge that it is often difficult to predict the ebb and flow of both foreign or non-local patients from outside their catchment area.

Unaccounted for in central planning and budgeting, these two additional populations strain not only already limited health resources but also HRH and administrative capacity. This pressure on human resources impacts the facilities' ability to respond efficiently and adequately to the local population's health needs, leading to long wait times, crowded wards, and suboptimal health outcomes. Management of everyday facility administration and logistics is also affected. Absorbing additional patients outside of the facility's catchment area carries significant cost implications. The additional strain that these patients place on the facilities results in acutely felt financial burdens.

Lastly, while both foreign and non-local Zambian HIV positive patients choose to access health services in Nakonde, facilities report that it's often very difficult to track and follow-up with patients after initial screening and diagnosis as many choose to return to their hometowns. Thus, ART adherence monitoring proves difficult, especially in the face of distance and human resource limitations.

## Chienge

Chienge is located approximately 37 km from the Congolese border in the most northern district of the Luapula Provence of Zambia. Given its close proximity to the border, key informants interviewed (n=13) at the district health facilities visited (n=4) report that primarily Congolese nationals cross the border to seek health services in Zambia. What separates this district from others included in this study, is the significant number of refugees that the district health facilities serve, both those that pass through Chienge on their way to other refugee camps, as well as those that permanently settle in the area.

The United Nations Human Rights Commission (UNHCR) established a refugee camp in Chienge in 2016 to act as a "holding place" for asylum seekers before they are relocated to larger and more well- equipped camps further inland. Seeking to escape war and political instability, nearly 1,000 refugees pass through Chienge every week. However, that figure is reported to vary. Fluctuations in the number of Congolese refugee patients received can be credited to waves of violence and instability across the border.

*UNHCR refugee camp in Chienge established in 2016 to act as a "holding place" for Congolese asylum seekers*

Political instability, and rumor of conflict drive more people across the porous Zambian/DRC border into Chienge. Open for approximately 18 hours a day, the border allows for relatively free and unrestricted movement of people. Most foreign patients seeking care in Chienge come from just across the border from Pweto and do not travel long distances to get to a facility. Many reportedly walk across the bush and do not cross through official border channels. Because many have chosen to informally settle in the district and have thus adopted both the local language and culture, approximation of actual foreign patients proves difficult. The number of foreign patients treated is often not officially tracked and recorded. Health providers rely on accents and general language barriers to identify non-Zambian health seekers.

### *Key Driving Forces*

Instability and rumors of unrest are strong drivers and predictors of patient flow from across the border. Therefore, the number of foreign patients served at facilities in Chienge varies depending on the civil and political happenings in the DRC. As the conflict across the border intensifies and spreads, more Congolese are seen seeking sanctuary in Zambia.

However, key informant interviews also indicated that regardless of the political instability across the border, Congolese patients prefer and choose to seek care in Zambia. For many, crossing into Chienge is their only option. There are reportedly no national, government run facilities just across the border in DRC. This fact further explains why many opt to seek health care in Zambia, where public primary health care services are free. Additionally, while private facilities exist to serve the border community of Pweto, they are expensive and financially inaccessible for the majority of that population. According to key informants interviewed, Congolese patients can expect to pay between 10-11 ZMW for a general physician consultation, 30 ZMW for a malaria test and 20 ZMW for antibiotics.

The typical medical services sought by these patients vary, though the majority of facilities interviewed reported that foreign patients, especially mothers and children, cross into Zambia during community outreach events and during health promotional campaigns, related to general MCH health, immunizations, male circumcision and health education. Additional incentives provided, such as free screening and mosquito nets, serve as additional drivers and predictors of cross-border migration.

Additionally, key informant interviews indicate that during the fishing season (March- November) an influx of Congolese patients is seen at Chienge facilities. Many Congolese cross into the district for livelihood purposes during those nine months and generally return to Congo at the end of the season.

### *Impact on Health Facilities*

Congolese and refugee patients place a significant burden on the district health system. While the Zambian government is reportedly aware of the large flow of refugees streaming into Chienge, key informants indicate that little has been done centrally to mitigate the effect on local health service provision and better plan and budget for those additional needs. The district's absorption capacity is limited, and essential

health services are overstretched. Key informants reported that budgets and resources are currently not sufficiently allocated to serve both the local Chienge catchment and foreign Congolese population.

Both human resources and commodities are strained. A shortage of trained and adequately skilled health workers has reportedly hindered effective and efficient health service delivery. Given the unpredictability of foreign population inflows into Chienge, medical commodity planning and management has proven difficult. As a result, district facilities are consistently experiencing monthly stock-outs of medications, such as antibiotics, anti-malarials and ART treatment.

## Chirundu

Chirundu is located approximately 1 km from the Zimbabwean border in the Southern Provence of Zambia. The Zambezi river and the Hurungwe and Charara game park, act as natural geographic barriers preventing cross-border migration into Zambia. Unlike the other three districts visited, very few facilities of those contacted (n=5) reported to serve foreign patients. Only facilities near the official border crossing reported receiving non-Zambians, most notably the Mtendere Mission Hospital[6] that is situated at the main crossing point. Crossing into Chirundu is also not as "easy" as it was observed in other districts. The border is open only a few days a week and mobility is significantly limited by the presence of the game park on the Zimbabwe side of the border. Official, legal crossing is limited, and illegal crossing was not noted by any of our key informants.

Unlike the other three districts studied, district facilities in Chirundu report ongoing cross-border communication and coordination with both with the District Health Director (DHD) and the District Medical Officer (DMO) in Zimbabwe. Collaborations first began in 2014 and were primarily initiated as a result of cross-border malaria outbreaks and transmission. Coordinated through the International Organization for Migration (IOM), collaborative meetings have since been held on as as-needed basis to discuss surveillance, monitoring and early identification efforts and procedures for malaria as well as other disease outbreaks, such as Cholera and Ebola. Additionally, the possibility of health synchronization efforts has been discussed, such as collaboration with malaria spraying and health education during the child health week campaign.

### *Key Driving Forces*

As observed in the other three districts, Zambia's free health care is key driver of migration. Availability of medical commodities and services and the reportedly higher quality of care further contribute to cross-border migration for health services. Facilities across the border are reportedly poorly equipped, lacking essential medicines, medical supplies and the ability to run diagnostics. This coupled with a lack of health facilities just across the border and a reported shortage of trained and adequately skilled health workers has prompted Zimbabweans to cross into Zambia.

Foreigners that seek services in Chirundu often do not travel long distances to reach a facility. Many live just across the border or are already in-transit, mostly truck drivers, fishmongers, and day traders, who happen to fall ill and require medical attention while in Chirundu. Key informant interviews indicate that in-transit patients from as far as South Africa, Tanzania, and Malawi have been served by Chirundu facilities.

[6] Please note that this is the only non-government facility interviewed.

Given that the nearest facility across the border is in Karoi, approximately 150 kilometers away, it is logical that many choose to access care in Chirundu.

Additionally, key informant interviews indicate that a seasonal influx of foreign patients is observed in Chirundu, especially during the rainy, malaria season. This is primarily attributable to Zimbabweans crossing into Zambia to access treatment and anti-malarias that are reportedly unavailable or out of stock in Zimbabwe.

### *Impact on Health Facilities*

Foreign patients (in-transit, and not necessarily from Zimbabwe) and Zambian patients from outside of the formal catchment area reportedly significantly impact district health financing and planning. Similar to the other three districts, outside populations accessing care in Chirundu place a significant strain not only on medical personnel and services, but also on commodities, most prominently on ART medication. Near stock-out levels of ART were reported by the majority of facilities interviewed. While most facilities visited report that they order medical supplies and medications based on previous months consumption rates, they acknowledge that planning for health seekers from outside of their catchment area proves difficult as migration and demand patterns vary. Given that this additional population is not captured in the district population count, central level macro-planning often leads to shortages and delays in procurement and distribution.

Additionally, foreign patients served are often "lost" in follow-up. Those patients placed on ART and TB lines of treatment are particularly affected. After receiving care in Zambia, many, especially in-transit patients return to their hometowns. Thus, adherence monitoring proves especially difficult and distorts treatment and cure rates for the district.

## Summary of Recommendations from In-Country Interviews

As part of the interview process, key informants were asked to suggest ways to mitigate the impact of cross-border health seekers on their facilities/districts. Below is a summary of some of the top suggestions discussed.

Decrease the number of cross-border health seekers:

- Fortify Border Security: Given the porous nature of Zambia's border, mitigation efforts can prove difficult. However, when asked what policy measures and other actions might be taken by the GRZ, MOH, donors and other actors to mitigate the impacts of cross-border health seeking, many key stakeholders interviewed focused heavily on the need to fortify border security and limit the ability of foreigners to freely enter into Zambia. Many suggested that official documentation should be required to enter into Zambia. The fact that a passport is often not legally required to enter the country leads to easy entry, especially around the Tanzanian border. Measures to fortify border security would also have significant humanitarian, ethical, social, and trade implications. These suggestions were made solely in the context of the potential impact on healthcare facilities.

- Introduce Fee-for-Service: As access to free health services and medicines is a key driver of cross-border migration, some interviewees suggested establishing a payment scheme for foreign nationals, as a way to deter foreign patients from seeking treatment in Zambia. While, in theory, foreign patients are expected to pay for care, they are often not charged by facilities. Creating a fee-for-service structure for standard services can be considered as a way to mitigate the number

of foreign patients that primarily enter into Zambia to benefit from the free healthcare system in place; however, stakeholders note the need to be wary of the human implications in this scenario. Notably, most healthcare providers interviewed stated that they would continue to provide services free of charge should a foreign patient be unable to pay.

Increase the capacity of border facilities to treat cross-border health seekers:

- *Increase Resources*: Key informants also saw the need to increase health facilities' staffing capacities and improve staffing resource alignment. The need to align capacity and demand was deemed vital in streamlining the efficiency and quality of care. Many noted that if facilities' capacity and demand are aligned, delays in care would be reduced and quality would improve. In order to more efficiently absorb foreign patients and lessen impact on border facilities, access to mobile wellness clinics for truck drivers should be provided. Ready access to HIV/AIDs and STI testing and other primary health care services for long-distance truck drivers, as well as commercial sex workers, will not only lessen demand on facilities, but increase the number of people gaining timely access to treatment and care. Constructing more facilities along the border to absorb the influx of foreign patients and act as "gatekeepers", could further alleviate pressure from facilities further inland and allow for better quality of health services rendered.

- *Greater Flexibility in Commodity Allocation*: Greater flexibility for commodity allocation to border districts was considered a top priority by nearly all of the key informants interviewed. The chronic commodity shortages faced by border facilities in all four border districts visited strongly suggests that a contingency plan should be implemented as buffer against foreign patient influxes. While planning and budgeting for districts considers local population headcount, catchment data is based on census data last collected in 2010 and does not account for foreign health seekers, internal migrants, or informal settlers and refugees. Additionally, the districts' most recent catchment estimates are a function of a census projection and thus simple changes in population growth result in divergence from the census model. Thus, it would be inaccurate to completely attribute the disparity between CSO (Central Statistics Office) population and actual size of population served to foreign traffic. However, recognizing that border district health facilities and commodity supply chains may be significantly impacted by foreign patient influxes is necessary for effective border health system. Allowing for the ordering and supplying of medical commodities to be done on a monthly, rather than quarterly basis, may also help alleviate stock-outs and result in a more reliable and accurate supply of medications.

Collaborate with cross-border facilities:

- *Cross-Border Collaboration*: Many suggested promoting and encouraging cross-border collaboration to improve health provision, surveillance, mapping, and information-sharing. While the majority of the facilities visited did not engage in active communications and relations with facilities across the border, many welcomed the notion of increasing collaboration efforts to manage and better prepare for the number of foreign patients accessing care in Zambia. Creating a cross-border dialogue has the potential to improve regional ability to prevent, detect and respond to emerging threats.

# COMPUTATIONAL MODELING AND ANALYSIS

## Methodology

### *SIGMA Analysis*

In order to determine the current situation regarding cross-border health seeking behavior, our SPACES team used the SIGMA (Strategic Integrated Geo-temporal Mapping Application) platform to generate a model of Zambia's health service delivery locations as well as the patient populations within Zambia and bordering countries.

We populated SIGMA with data related to population distribution, service delivery location coordinates and catchment areas. We obtained geographic population data from a publicly available database (GPW-v4[1]). We acquired geospatially explicit service delivery location data from the Zambian Ministry of health DHIS2 database to plot specific facilities on a map with catchment areas around each location. Each catchment areas radius represents the greatest distance individuals may travel to obtain health care services. By overlaying these catchment areas onto geospatially explicit population data, SIGMA can determine the population size within reach of the facility.

SPACES utilized a series of computations to determine the demand for various services within each facility's catchment area. In the below tables, the computations shown use Nakonde, a SPACES-visited district for which full consumption data was provided, as an example.

For each scenario we quantified the number of people who we expected to demand services. Then, we compared the SIGMA output with data from DHIS2 to determine the extent to which the expected demand differed from the actual reported demand for services. We were able to run these comparisons for the four districts where facility-specific data was provided. Full results are provided in the Findings, Conclusions, and Recommendations section.

#### Calculating Demand for ART services

(Population within catchment area of facility) x (prevalence of HIV) x (proportion of individuals aware of HIV+ status) x (proportion of HIV+ aware individuals who report being on ARTs) = expected population on ARTs (Model Expected demand)

| Measure | Value | Source |
|---|---|---|
| Population in 20K catchment area of health facilities in Nakonde | 240,465 | SIGMA |
| HIV prevalence (Muchinga province) | 5.9% | ZAMPHIA Fact Sheet |
| Proportion aware of HIV status | 67.3% | ZAMPHIA Fact Sheet |
| Proportion of those aware of status utilizing ART | 85.4% | ZAMPHIA Fact Sheet |
| Expected demand for ART in Nakonde | 8,154 | Calculated |
| Actual ART consumption in Nakonde | 36,970 | DHIS2 |

#### Calculating Demand for Malaria services

(Population within catchment area of facility) x (prevalence of malaria) x (proportion of individuals with fever who received malaria test) = expected population receiving malaria treatment

| Measure | Value | Source |
|---|---|---|
| Population in 20K catchment area of health facilities in Nakonde | 240,465 | SIGMA |
| Incidence of malaria | 60.3% | Zambia MIS2015 |
| Proportion of febrile patients receiving malaria test | 87% | Malaria Operational Plan FY 2018 for the USAID President's Malaria Initiative in Zambia |
| Expected demand for malaria medication | 126,150 | Calculated |
| Actual malaria treatment consumption | 22,775 | DHIS2 |

### Calculating Demand for Tuberculosis services

(Population within catchment area of facility) x (prevalence of TB) x (proportion of individuals with fever who received malaria test) = expected population receiving tuberculosis treatment

| Measure | Value | Source |
|---|---|---|
| Population in 20K catchment area of health facilities in Nakonde | 240,465 | SIGMA |
| Prevalence of TB | 0.15% | National TB Prevalence Survey 2013 |
| Proportion of TB health seekers | 35% | National TB Prevalence Survey 2013 |
| Expected demand for TB medication | 126 | Calculated |
| Actual TB treatment consumption | 40 | DHIS2 |

#### *Limitations*

As the consumption and health facility data provided was limited to the four districts visited by the SPACES team, the analysis could only be completed for facilities with available data. In addition, we are unable to attribute cross-border utilization as a cause for consumption figures below or above the expected values in localized results, as health-seekers from other parts of Zambia may also be a contributing factor to these discrepancies. For example, as supported in SPACES qualitative interviews, health care seekers with HIV are likely to travel outside their own community to retain anonymity when seeking care. Patterns consistent with this behavior would be more apparent with full consumption data, and overall utilization and cross-border health care seeking behavior could be further analyzed. Systems and decision maps and models could not be validated without full consumption data.

## Decision Tree Map and Model

#### *Model Structure*

Our team developed a health seeking behavior decision tree model in Microsoft Excel using the TreePlan add-in[2] to understand non-Zambian's thought process as they decide whether or not to cross the border to seek care under a variety of circumstances and scenarios. We modeled various populations of non-Zambians living within 5, 10, and 20 km of the border. The model follows both subjective, judgment-based considerations and objective, situational constraints that apply to non-Zambian healthcare seekers via a series of Bernoulli trials as individuals decide whether to seek health care in Zambia under a variety of circumstances and scenarios. The decisions are given binomial outcomes where success results in continuing care-seeking and failure results in terminating care-

seeking. Figure 1 shows the flow of our model and Appendix Table 2 shows the models input parameters, values, and sources. Factors included in the decision tree model are consistent with factors derived from qualitative research (see table on page 7).

Throughout all of the scenarios, the window of probability is assumed to be one year for all parameters. Since the likelihood of having a health need and that of seeking health care varies based on geographic region, the value of these parameters varies by scenario.

Whether or not a health care seeker is located in Zambia drives the sequence of decision making thereafter. This probability also varies by geographic location and scenario. If located in Zambia, the next consideration is whether the individual is aware of Zambian healthcare services. If this trial succeeds, the next consideration is whether the individual has reasonable access to Zambian healthcare services and facilities. Finally, a non-Zambian individual located in Zambia considers trust in Zambian service providers. If these trials are all affirmative, then an individual seeks care in Zambia. If any are negative, then an individual does not seek care in Zambia.

If not located in Zambia, more considerations apply. First, the model considers whether the individual is aware of healthcare services in the country of origin. If so, the healthcare seeker must separately consider whether both access and trust are sufficient to seek care in the country of origin, and then whether the individual can afford care in the country of origin. If the healthcare seeker is not aware of services in the country of origin, or if the services are not accessible, trustworthy or affordable, the model considers likelihood that the healthcare seeker is aware of Zambian healthcare services. The individual then considers whether the services and facilities are accessible and level of trust in these services. If these are all affirmative, the healthcare seeker considers whether it is easy enough to cross the border. This parameter is highly influenced by geographic location, as borders such as that with Zimbabwe, lined by geographic barriers like national parks and the Zambezi River, are much less permeable than borders with countries like Tanzania and DRC, and thus varies based on a given scenario. As ease of border crossing or permeability increases, the likelihood that an individual crosses the border increases. If any of these conditions are negative, the individual does not seek care in Zambia.

Other scenarios parameterized include consumption expectations during a seasonal malaria outbreak in Chienge as well as such expectations during and after the construction of a dry port in the DRC adjacent to the border with Zambia.

The probabilities for each of these factors varied for the different scenarios and were based on a variety of sources from reports, publications as well as estimates based on in-country experience. The probabilities for our baseline scenario and the variations used to parameterize the various scenarios we selected are both described below and fully detailed with sources and explanations in Appendix Table 2.

### *Simulations and Model Outcomes*

We ran several simulations, varying the number of non-Zambians in the model as well as the probabilities for each of the decision factors based on context. For each simulation, we also used population sizes from SIGMA for varied distances from the border, including 5 km, 10 km, and 20 km from the border. We modeled scenarios for which some amount of consumption data was available for comparison, though it must be noted that associations discovered within these comparisons cannot be considered causal without full detail.

### Baseline Simulation

In our baseline scenario, we populated our model with parameters from a variety of sources as detailed in Appendix Table 2. The baseline is a broad scenario meant to cover the length of the Zambian border with all parameters averaged across all border regions. Each of the borders is expected to vary above and below the baseline as locally specific parameters apply for each decision point.

### Democratic Republic of Congo Border

The first targeted scenario focused on non-Zambians in the region bordering the DRC. Data is available for comparison in Chienge and Chililabombwe. Parameters (as described in Appendix Table 2) were set to apply in a Congolese setting, where a combination of a moderately permeable border, frequent political unrest, and lower overall rates of both health care access and health seeking drove the most significant changes from baseline parameters. To model these factors, we decreased the rate of health seeking, increased the likelihood of a non-Zambian to be located in Zambia to reflect refugees and asylum-seekers, increased the ease of crossing the border from baseline parameters, and decreased the likelihood that affordable care would be available in the health care seeker's country of origin.

### Zimbabwe Border

Since data was available for the district of Chirundu, bordering Zimbabwe, this scenario was also modeled. Relevant location-specific parameters for Zimbabwe include mostly inhibiting factors, though high user fees make affordable care difficult to find. This can also drive those with a health need from seeking care in the first place, however, so both health seeking behavior and available affordable care were decreased. In addition, due to geographic barriers in the region, we increased the difficulty of crossing the border and reduced the awareness of Zambian health care.

### Tanzanian Border

We ran another scenario with non-Zambians in the region bordering Tanzania, where data is available from facilities in Nakonde for comparison. In the Tanzanian setting, a highly porous border and somewhat higher rates of health care seeking resulted in the most significant differences in variables from baseline. To model these factors, we increased parameters for care-seeking behavior, ease of crossing the border, and the awareness of Zambian health care, all of which are expected to drive up cross-border health care seeking behavior.

### Seasonal Malaria Outbreak Scenario

To test the impact of seasonally predictable malaria outbreaks in the district of Chienge, the health care seeking behavior only applies to malaria prevalence rather than overall health needs. Therefore, the likelihood of a health care need was set to 27.5%, which reflects the incidence of malaria in Luapula. "Access to health care in country of origin" variable was adjusted from 30% to 10% to represent the strain that would occur in the DRC if an outbreak were to occur. This updated value is based on USAID President's Malaria Initiative report of the 2015 malaria prevalence in DRC, which stands at 24.6% in contrast to more moderate prevalences in Tanzania (11.40%) and Zimbabwe (11.42%).

### Kasumbalesa dry port – during construction

Currently, a dry port is under construction in Kasumbalesa, DRC, adjacent to the Zambian border. The expectation is that the construction of this port will begin to increase traffic through the region as jobs are created to assist in the construction and staffing of the facility. In order to model the effects during construction, we increased the likelihood of being located in Zambia and being aware of Zambian health care.

### Kasumbalesa dry port – after construction

Once the port is complete, full-time staff will increase the numbers of people in the region and it will continue to drive up non-Zambian traffic in the border area as trade is increased as well as encourage the development of the area with, among other public facilities, hospitals and health care clinics. To model these impacts, we maintained the increase in the likelihood of being located in Zambia but also increased the accessibility of care in country of origin to reflect new facilities on the DRC side of the border.

## Decision Tree Map

In the decision tree map, (see Appendix, Decision Tree Map) each tan circle shows a decision point, resulting in 27 possible outcomes. Only 6 of these outcomes resulted in a border crossing to seek health care, as described in Appendix Table 3. Each time the model is run, a single individual proceeds through each decision point, following a single branch to a final outcome. The probability that one branch is chosen over the other, and therefore that the final outcome results in a border crossing, depends on the scenario-based parameters given in Appendix Table 2. Using the below map, the model was run the number of times as the population in question in order to determine the proportion of the population that seeks care in Zambia given these parameters.

## Results

### *SIGMA Results*

| Metric | Facilities Included | Catchment Radius Around Facility | Expected Patient Demand (SIGMA) | Actual Treatement Consumption (HMIS) | Estimated Difference between Expected and Actual | Percentage Difference between Expected and Actual |
|---|---|---|---|---|---|---|
| HIV | Chililabombwe | 5 km | 1,314 | 76,047 | 74,733 | 5788.40% |
| | Chililabombwe | 10 km | 4,324 | 76,047 | 71,723 | 1758.53% |
| | Chililabombwe | 20 km | 10,593 | 76,047 | 65,454 | 717.88% |
| | Chirundu | 5 km | 3,055 | 41,875 | 38,820 | 1370.62% |
| | Chirundu | 10 km | 8,148 | 41,875 | 33,727 | 513.93% |
| | Chirundu | 20 km | 22,251 | 41,875 | 19,624 | 188.19% |
| | Chienge | 5 km | 1,253 | 32,303 | 31,050 | 2578.41% |
| | Chienge | 10km | 3,149 | 32,303 | 29,154 | 1025.94% |
| | Chienge | 20 km | 12,527 | 32,303 | 19,776 | 257.86% |
| | Nakonde | 5 km | 493 | 36,970 | 36,477 | 7498.96% |
| | Nakonde | 10 km | 1,085 | 36,970 | 35,885 | 3405.81% |
| | Nakonde | 20 km | 8,154 | 36,970 | 28,816 | 453.39% |
| Malaria | Chililabombwe | 5 km | 9,728 | 27,886 | 18,158 | 286.66% |
| | Chililabombwe | 10 km | 32,021 | 27,886 | -4,135 | 87.09% |
| | Chililabombwe | 20 km | 47,767 | 27,886 | -19,881 | 58.38% |
| | Chirundu | 5 km | 4,858 | 2,389 | -2,469 | 49.17% |
| | Chirundu | 10 km | 12,957 | 2,389 | -10,568 | 18.44% |
| | Chirundu | 20 km | 21,548 | 2,389 | -19,159 | 11.09% |
| | Chienge | 5 km | 9,209 | 46,668 | 37,459 | 506.79% |
| | Chienge | 10km | 23,143 | 46,668 | 23,525 | 201.65% |
| | Chienge | 20 km | 56,073 | 46,668 | -9,405 | 83.23% |
| | Nakonde | 5 km | 12,525 | 22,775 | 10,250 | 181.84% |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Nakonde | 10 km | 27,577 | 22,775 | -4,802 | 82.59% |
| | Nakonde | 20 km | 126,150 | 22,775 | -103,375 | 18.05% |
| Tuberculosis | Chililabombwe | 5 km | 81 | 298 | 217 | 369.02% |
| | Chililabombwe | 10 km | 266 | 298 | 32 | 112.11% |
| | Chililabombwe | 20 km | 397 | 298 | -99 | 75.15% |
| | Chirundu | 5 km | 127 | 254 | 127 | 199.26% |
| | Chirundu | 10 km | 340 | 254 | -86 | 74.71% |
| | Chirundu | 20 km | 565 | 254 | -311 | 44.93% |
| | Chienge | 5 km | 32 | 197 | 165 | 624.29% |
| | Chienge | 10km | 79 | 197 | 118 | 248.40% |
| | Chienge | 20 km | 192 | 197 | 5 | 102.52% |
| | Nakonde | 5 km | 13 | 40 | 27 | 319.31% |
| | Nakonde | 10 km | 28 | 40 | 12 | 145.02% |
| | Nakonde | 20 km | 126 | 40 | -86 | 31.70% |

### Accessing HIV Services

Based on the SIGMA simulations with a catchment area radius between 5 and 20 kilometers, we estimate that up to 181,080 non-Zambians regularly cross the border to access treatment for HIV in the regions identified. If we look specifically in Nakonde, where the border is most porous, we see that consumption is farthest above expected, with 28,816 - 36,477 more treatment seekers for HIV than expected. However, as the qualitative interviews indicate, there is a large component of these that are very likely to be Zambians from districts other than Nakonde, though we cannot validate the proportion.

### Accessing Malaria Services

Based on the SIGMA simulations with a catchment area radius between 5 and 20 kilometers, we estimate that up to 77,685 non- Zambians regularly cross the border to access treatment for malaria in Zambia. The region with the most cross-border health seeking behavior for malaria appears to be Chienge, where malaria prevalence is highest, and where the bordering country of DRC has the highest malaria prevalence of any other country bordering Zambia. We have modeled this scenario in the decision tree model; results are below.

### Accessing Tuberculosis Services

Our SIGMA simulations show that when there is an 5-20 kilometer catchment area radius for service delivery sites, up to 537 non-Zambians access tuberculosis services in Zambia. According to our simulations, crossing the border for tuberculosis services occurred much less frequently than crossing the border for HIV or malaria services, in part because tuberculosis prevalence is much lower than malaria or HIV in Zambia.

## *Decision Tree Map and Model Results*

### Current Situation

The results depend in part on the distance from the border that health-seekers could be expected to travel. We ran populations in distances from 5-20 kilometers of the Zambian border to acquire a range of possible outcomes.

| Catchment size | Non-Zambian Population | Result | Proportion |
|---|---|---|---|
| 5 km catchment | 883,085 | 195,515 | 0.2214 |
| 10 km catchment | 1,757,626 | 389,138 | |

| | | | |
|---|---|---|---|
| 20 km catchment | 4,122,331 | 912,684 | |

Overall, our model indicates a possible range of 195,515 - 912,684 cross-border health care seekers in a given year across Zambia. With region-specific scenarios, below, we seek to identify areas where this behavior is particularly prevalent.

### Democratic Republic of the Congo border results

As with all of our scenarios, we pulled non-Zambian population numbers from SIGMA in distances from 5-20 kilometers of the border with DRC to acquire a range of possible outcomes.

| Catchment size | Non-Zambian Population | Simulation Result | Proportion |
|---|---|---|---|
| 5 km catchment | 241,446 | 51,669 | 0.214 |
| 10 km catchment | 613,920 | 131,379 | |
| 20 km catchment | 1,969,907 | 421,560 | |

A comparison may be drawn to the rates of health care consumption seen in the districts closest to the DRC border where data is available, Chienge and Chililabombwe. Actual consumption rates stand at 171.2% of expected rates based on the Zambian population in the facilities' widest possible catchment areas (with a radius of 20 km), showing an absolute total of over 76,000 more treatment seekers than disease prevalence would indicate. This does fall within the range suggested by the model, but without the rest of the country's utilization rates (or data on the rest of the DRC border region), it is not possible to attribute an exact percentage of the excess utilization to cross-border health seeking versus health care seeking from other districts in Zambia. There is a clear association between higher than expected malaria utilization rates in Chienge and Chililabombwe and the overall high malaria incidence in the region, both in Zambia and on the DRC side of the border. HIV utilization is also high in these districts, continuing the trend observable in the utilization data of each of the available districts.

### Tanzanian border results

Notably, the Tanzanian border included larger populations than other border region scenarios at each of the 3 distances run through the model.

| Catchment size | Non-Zambian Population | Simulation Result | Proportion |
|---|---|---|---|
| 5 km catchment | 156,148 | 61,819 | 0.396 |
| 10 km catchment | 224,785 | 88,992 | |
| 20 km catchment | 397,467 | 157,357 | |

In Tanzania, as expected, both the absolute total and the proportion of border crossings approximated by the model was higher than other scenarios at nearly 40% of health seekers. The range of possible outcomes from about 62,000 to over 157,000 border crossings per year, reflect Tanzania's porous border with Zambia and partly reflect the aforementioned larger population size, and may go some way toward explaining the astronomically high HIV utilization rates in Nakonde (a trend that does hold, to an only somewhat lesser extent, in other regions where data is available).

### Zimbabwe border results

As mentioned before, Zambia's border with Zimbabwe is bounded by geographic barriers including the Zambezi River and a number of national parks. It is also more sparsely populated at each of the distance thresholds than the other border regions investigated.

| Catchment size | Non-Zambian Population | Simulation Result | Proportion |
|---|---|---|---|
| 5 km catchment | 93,729 | 7,086 | 0.076 |
| 10 km catchment | 135,145 | 10,217 | |

| | | | |
|---|---|---|---|
| 20 km catchment | 209,246 | 15,819 | |

Accordingly, our scenario in the Zimbabwe region resulted in a low proportion of border crossings for health care seeking, though the populations are large enough that this is still a significant potential source of health care utilization for districts such as Chirundu. Though the results indicated only about 7.6% of health care seekers in close proximity to the Zambia-Zimbabwe border would cross in order to seek health care, this resulted in a total of 7,086 – 15,819 border crossings, per our model. SIGMA data shows minimal divergence from malaria and tuberculosis consumption expectations in Chirundu, but the HIV utilization again exceeds expectations by almost double at the lowest end of the range with over 19,000 extra cases per year. It is worth noting that these Chirundu-specific SIGMA results exceed the border crossings the decision tree model predicts for the entire border region with Zimbabwe, suggesting that there may be other causes for the high utilization that we observe.

### Chienge Seasonal Malaria Outbreak Scenario Results

We ran scenarios looking at the impact of a predictable malaria outbreak in the district of Chienge, bordering DRC, to understand the impact on cross-border health seeking behavior.

| Catchment size | Non-Zambian Population | Simulation Result | Proportion |
|---|---|---|---|
| 5 km catchment | 14,730 | 985 | 0.0669 |
| 10 km catchment | 32,184 | 2,153 | |
| 20 km catchment | 76,266 | 5,102 | |

In this scenario, the model is only examining crossings specifically attributable to malaria care-seeking. As previously reported SIGMA results have shown, Chienge expects anywhere from 10,883 – 66,268 malaria cases per year, depending on the catchment size used, and the actual consumption data showing 46,668 cases does fall within that range. Our scenario shows that in that broad range there is likely to be some percentage of the total, likely between 7% (for a 20 km catchment) and 9% (for a 5 km catchment), that is the result of cross-border health care seeking.

### Kasumbalesa Dry Port – During and After Construction Scenario Results

For the Kasumbalesa Dry Port scenarios, we used SIGMA population sizes from the Kasumbalesa Urban Health Post in Chililabombwe.

During construction:

| Catchment size | Non-Zambian Population | Result | Proportion |
|---|---|---|---|
| 5 km catchment | 1,654 | 384 | 0.23 |
| 10 km catchment | 2,752 | 638 | |
| 20 km catchment | 5,562 | 1,290 | |

After construction:

| Catchment size | Non-Zambian Population | Result | Proportion |
|---|---|---|---|
| 5 km catchment | 1,654 | 348 | 0.21 |
| 10 km catchment | 2,752 | 579 | |
| 20 km catchment | 5,562 | 1,170 | |

In this highly specific scenario, the model predicts that we can expect up to 1,290 border crossings in the immediate area in the years during construction of the dry port, with up to 1,170 in the years thereafter due to increased traffic from the port.

## Summary of Findings from Computational Modeling and Analysis

We must emphasize that findings are not conclusive regarding cross-border health seeking behavior in the absence of complete required data on country utilization rates; however, our results do point to some leverage points critical in the system.

First, excess rates of health care consumption do correlate to observed border permeability in the four districts with available, which does suggest that cross-border health seeking is a significant contributing factor to these high utilization rates, though we cannot yet ascertain to what extent this variable is impacting consumption.

To the extent that cross-border health seeking is impacting consumption, several points of leverage can be identified. In addition to border permeability, which correlates also to the likelihood of a non-Zambian already being in Zambia when a health need occurs, there is also the status of the health system in the country of origin, which we break down to four factors: the level of awareness of care options, trustworthiness, accessibility, and affordability of care.

Second, among the consumption rates of HIV, malaria, and tuberculosis treatment, we find that HIV utilization consistently exceeds expectations by the highest margins, both in percentages and absolute case totals in the one year's worth of data we received, regardless of the catchment distance used for analysis. Qualitative research, decision tree modeling, and these observed HIV utilization rates suggest that there are additional contributors driving HIV health care consumption over expectations. SPACES in-country qualitative research indicates a large proportion of unexpected health care consumption is driven by Zambian health seekers with stigmatized illness, in particular HIV, seeking care outside their own communities, among other possible reasons. This is supported by the observed consumption rates, the excesses of which cannot be explained by cross-border health seeking alone.

Scenarios that are most likely to impact cross-border health seeking behavior are those that increase the likelihood of more non-Zambians being located near the border or in Zambia, consequently becoming more aware of Zambian health care services. This cause can be extrapolated to scenarios like political unrest or natural disasters resulting in refugees or to large projects in bordering countries that may draw people closer to or across the border of Zambia.

In order to refine our conclusions, SPACES recommends the analysis of complete country health care consumption data at the facility level. This will allow SPACES to conduct the SIGMA analysis across all of Zambia and to compare expected utilization rate to actual utilization rate, identify geographic patterns and trends, and account for all of the Zambian health seekers, allowing for a total number of non-Zambian health seekers to be estimated and actual financial impact quantified so that possible solutions can be further evaluated.

# APPENDIX

## 1. Information sheet / Consent form

**Zambia Cross-Border Health seeking Behavior Consent Form**

You are being ased to take part in a research study of how and why people seek healthcare in Zambia. We are asking you to take part because you have provided services to or have knowledge of healthcare seekers from outside of Zambia. Please read this form carefully and ask any questions you may have before agreeing to take part in the study.

What the study is about: The purpose of this study is to help the Ministry of Health better understand why people from outside of Zambia choose to come to Zambia for healthcare and how they select healthcare facilities. This study is being conducted by researchers from LINC, a US-based consulting firm in partnership with the United States Agency for International Development (USAID) and Johns Hopkins University in the United States.

You must be over 18 to take part in this study.

What we will ask you to do: If you agree to participate in this study, we will conduct an interview with you. The interview will include questions about:

- your experience at this facility
- your knowledge of the decision-making of non-Zambians who seek healthcare at this facility or other facilities within Zambia

The interview will take about 45 minutes to complete.

Risks and benefits:

There is the risk that you may find some of the questions about the health seeking behaviors of non-Zambians to be sensitive.
There are no benefits to you. Anticipating when and why people cross the border into Zambia to seek healthcare is challenging and we hope to learn more about people who have come into Zambia to seek healthcare.

Compensation: We will provide you with K30.00 ZMW to cover your cost of transportation and time spent while participating in this interview.
Your answers will be confidential. The records of this study will be kept private. Any report we make public will not include any information that will make it possible to identify you. Research records will be kept in a locked file, and only the researchers will have access to the records. Your name and identifying information will not be provided to anyone.

Taking part is voluntary: Participation in this study is completely voluntary. You may skip any questions that you do not want to answer. If you decide to participate, you are free to end the interview at any time, or to change your mind and ask that your answers not be included in the study.

If you have questions: The researchers conducting this study are Jenna White and Katerina Chilikova. Please ask any questions you have now. If you have questions later, you may contact the team at fieldwork@linclocal.org or +1 (202) 640 5462. If you have any questions or concerns regarding your rights as a subject in this study, you may contact the ERES Converge at +260 955 155633 or eresconverge@yahoo.co.uk.

Audio Recording: Please indicate whether or not you consent to the use of audio recording by LINC. The information and recording is for research purposes only.

Consent to Audio Recording (Circle one): YES NO

You will be given a copy of this form to keep for your records.

Statement of Consent: I have read the above information and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____ Date _____

Your Name (printed) _____

Signature of person obtaining consent _____ Date _____

Printed name of person obtaining consent _____ Date _____

This consent form will be kept by the researcher for at least three years beyond the end of the study.

## 2. Interview Guide for Key Informants

Date:
Interviewers:
Service Delivery Location:
Organization:

**Statement of Purpose:**
We are collecting information on behalf of USAID Zambia to better understand cross-border health seeking behavior. We are surveying individuals in four border towns as well as healthcare providers and those with knowledge of the healthcare space in Zambia. If you have 45 minutes we would like to ask you a few questions about cross-border health seeking behavior.

**I. SECTION 1: BACKGROUND INFORMATION**

1. To begin, can you please tell us about yourself?
   - 1.1. What is your position in this organization?
   - 1.2. How long have you been at this facility/organization?
2. Can you please give us an overview of this healthcare system?
   - 2.1. How many facilities are a part of this system?
   - 2.2. Are there unique services/commodities that are available at your facilities that are not readily available elsewhere?
3. Can you give us a rough sense of the operational capacity at each facility?
4. Do you keep data on usage and/or visitation by location?
   - 4.1. If "Yes" would you be willing to share this data?

**II. SECTION 2: CROSS-BORDER VISITATION**

5. What are the primary services/commodities sought by Zambian patients?
6. What are the primary services/commodities sought by patients from across the border?
   - 6.1. If there is a difference in services/commodities sought, "What do you think causes this difference?"
7. Do you have any information about health facilities across the border?
8. What percentage of patients originate from the other side of the border? (Estimate okay)
   - 8.1. About how many patients is that per month? (Actual number, not percentage)
9. By how much does the number of patients coming in from across the border fluctuate?
   - 9.1. Do you know what drives these fluctuations? (E.g. weather, political climate)
10. What are the primary motivations for the patients to cross the border to come to this facility?
    - 10.1. **Non-Health factors.** Are the non-Zambians you treat in Zambia primarily to seek healthcare? If No, what do you believe brings them to Zambia?
    - 10.2. **Availability of services/commodities.** Are there specific services / commodities available here that are unavailable at facilities across the border?
    - 10.3. **Quality of care.** How does the quality of care at this facility compare to the quality of care at facilities across the border?
    - 10.4. **Cost of care.** How does the cost of care at this facility compare to the quality of care at facilities across the border?

10.5. **Ease of travel to this location**. Logistically, how do non-Zambians reach this facility (e.g. by bus).

10.6. **Geographic barriers**. Are there any significant geographic barriers you are aware of that impact cross-border health seekers?

10.7. **Environmental factors.** Are there any significant environmental factors you are aware of that impact cross-border health seekers?

10.8. **Social or political factors.** Are there any significant environmental factors you are aware of that impact cross-border health seekers?

11. In your opinion, do the following factors drive cross-border health seeking behavior?

| **Factors** | **Yes**<br>This influences patients' decisions to seek care in Zambia | **No**<br>This does not influence patients' decisions to seek care in Zambia |
|---|---|---|
| Availability of services and commodities | | |
| Quality of care | | |
| Affordability of care | | |
| The recommendation of someone else | | |
| Distance to travel | | |
| Time to travel | | |
| Cost of travel | | |
| Ease of travel | | |
| Safety of travel | | |
| Personal relationships | | |
| Political conflict | | |
| Religion/personal faith | | |
| Race/ethnicity | | |
| Gender | | |
| Other reason:_____ | | |

12. In your opinion, what are the top 3 reasons people cross the border to seek healthcare at this facility?

| **Rank** | **Factor** |
|---|---|
| #1 | |
| #2 | |
| #3 | |

## III. SECTION 3: CLOSING QUESTIONS

13. Is there anyone else you suggest we speak with?
14. Is there anything else that you would like to share? (Anything else that we didn't ask, but should have?)

## 3. List of Facilities Visited

| District | Facility Name |
|---|---|
| Chililabombwe | Kawama Health Post |
| | Kakoso District Hospital (Level 1) |
| | Kasumbalesa Urban Health Center |
| | Lubengele Health Center |
| | Konkolo Health Post |
| Nakonde | Nakonde Urban Health Center |
| | Kaombwe Health Post |
| | Katozi Health Post |
| | Nakonde District Hospital (Level 1) |
| | Mwenzo Rural Health Center |
| Chienge | Luchinda Health Post |
| | Chupungu Rural Health Center |
| | Chienge District Hospital (Level 1) |
| | Lambwe Chomba Rural Health Center |
| Chirundu | Mtendere Mission Hospital |
| | Chibende Health Post |
| | Kapulurira Health Center |
| | Zaluanga |
| | Chipipo Rural Health Center |

### Table 1 HIV, Malaria and Tuberculosis Rates by Province

| Province | HIV Prevalence[3] | Malaria Incidence[4] | Tuberculosis Prevalence[5] | Population[6] |
|---|---|---|---|---|
| Central | 13.4 | 38.1 | 0.43% | 1,643,810 |
| Copperbelt | 14.2 | 42.3 | 0.87% | 2,542,132 |
| Eastern | 8.2 | 43.3 | 0.15% | 1,961,269 |
| Luapula | 9.3 | 10.3 | 0.23% | 1,215,294 |
| Lusaka | 16.1 | 27.5 | 0.67% | 3,119,190 |
| Muchinga | 5.9 | 60.3 | 0.15% | 1,011,655 |
| Northern | 9.7 | 52.6 | 0.57% | 1,430,543 |
| North Western | 6.9 | 94.6 | 0.34% | 902,631 |
| Southern | 13.4 | 2.2 | 0.22% | 2,019,696 |
| Western | 16.0 | 61.0 | 0.43% | 1,041,500 |

## Table 2 Decision Tree Parameters

| Current Conditions in Zambia | | | Democratic Republic of the Congo – Border Region | |
|---|---|---|---|---|
| Name | Probability | Probability source notes | Probability | Probability source notes |
| pHealthNeed | 0.900 | Over one year, 95% of population have health issues.[7] | 0.900 | Same as baseline |
| pRoutineSeeker | 0.800 | Over one year, 70.5% of people in Zambia and 87% of people in African countries overall sought healthcare. [8, 9]. | 0.600 | DRC shows much lower rates of health-seeking than baseline, likely due to conditions of political violence, though the sample sizes are small in source.[10] |
| pLocZambia | 0.150 | Estimation | 0.200 | Increased from baseline to reflect current political unrest and existence of refugee camps along the DRC border |
| pAwareHome | 0.935 | [8] | 0.935 | Same source as baseline |
| pAccessHome | 0.300 | "An estimated 70 percent of Congolese have little or no access to health care."[11] | 0.3 | Same source as baseline |
| pTrustHome | 0.500 | Patient-client satisfaction rates in public healthcare in Tanziania: 74.1% We adjusted this down for country of origin trust to reflect a preference found in SPACES qualitative research for seeking care away from home for stigmatized health needs (such as HIV treatment).[12] | 0.5 | Same source as baseline |
| pAwareZambia | 0.800 | There are not good sources for this specific parameter, but we have estimated that those in Zambia have near-total awareness, and those outside have a high level of awareness that is somewhat dependent on the permeability of the nearest border | 0.800 | We have kept this at baseline as the DRC border is, relatively speaking, moderately permeable |
| pAffordCare | 0.300 | Angola: 30% [13] | 0.27 | [10] |
| pTrustZambia | 0.750 | Patient satisfaction rates average around 70%. We adjusted this up for care found in Zambia to reflect a preference found in SPACES qualitative research for seeking care away from home for stigmatized health needs (such as HIV treatment).[14] | 0.750 | Same source as baseline |

| | | | | |
|---|---|---|---|---|
| pAccessZambia | 0.800 | No OOP expenses: 89% (non-ART), 82% ART<br>ACT availability: 90%<br>ARV availability: Not given<br>Vaccine availability: 98%<br>Medical equipment availability: 70%<br>Sanitation and water: 70%<br>Travel and wait time frequently exceed 2 hours, and travel expenses are much more commonly reported than healthcare user fees, both of which impact access behavior [14] | 0.8 | Same source as baseline |
| pEaseCrossing | 0.600 | Per Google maps, about 37% of Zambia's border is marked by a geographic barrier to crossing; this figure was adjusted upwards to account for the areas where the border includes checkpoints, which only exist in some border regions. | 0.8 | In-country qualitative research conducted by SPACES found that the border with DRC is permeable |

## Table 2A Decision Tree Parameters for Border Regions

| | Zimbabwe – Border Region | | Tanzania – Border Region | |
|---|---|---|---|---|
| Name | Probability | Probability source notes | Probability | Probability source notes |
| pHealthNeed | 0.900 | Same source as baseline | 0.900 | Same source as baseline |
| pRoutineSeeker | 0.750 | Assume lower levels of health care seeking due to user fee access issues and reported travel fees [15] | 0.900 | Care-seeking average in African countries is 87.5%; care-seeking in Tanzania is higher than average for other African countries[8, 16] |
| pLocZambia | 0.100 | Reduced from baseline due to geographic barriers impeding migration; the non-Zambian population in Zambia in this region primarily consists of truck drivers and in-transit populations | 0.350 | Increased from baseline to account for highly porous border |
| pAwareHome | 0.935 | Same as baseline | 0.935 | Same source as baseline |
| pAccessHome | 0.300 | Same as baseline | 0.300 | Same as baseline |
| pTrustHome | 0.500 | Same as baseline | 0.500 | Same source as baseline |

| | | | | |
|---|---|---|---|---|
| pAwareZambia | 0.700 | We have reduced this from the baseline level due to the higher degree of geographic barrier at the Zimbabwe border reducing migration levels and information flow. | 0.900 | We have increased this from baseline due to the highly porous nature of the border with Tanzania increasing traffic and information flow between Zambian and Tanzanian populations. |
| pAffordCare | 0.200 | User fees are the norm in Zimabwe and are often charged even if an exemption has been granted; also, travel fees are often prohibitive [15] | 0.300 | Living in poverty increased out of pocket expenses for care [15] |
| pTrustZambia | 0.750 | Same as baseline | 0.750 | Same as baseline |
| pAccessZambia | 0.800 | Same as baseline | 0.800 | Same as baseline |
| pEaseCrossing | 0.200 | Zimbabwe's border is largely blocked by lakes, national parks, safari areas, and the Zambezi River, all of which impede crossing | 0.900 | In-country qualitative research conducted by SPACES found that the border with DRC is porous |

## Table 2B Decision Tree Parameters for Scenarios

| Seasonal malaria outbreak in Chienge | | | Kasumbalesa dry port – during construction | |
|---|---|---|---|---|
| Name | Probability | Probability source notes | Probability | Probability source notes |
| pHealthNeed | 0.275 | Malaria specific | 0.900 | From DRC scenario |
| pRoutineSeeker | 0.600 | From DRC scenario | 0.600 | From DRC scenario |
| pLocZambia | 0.200 | From DRC scenario | 0.300 | We have increased this since any added population will be on top of the DRC-Zambia border |
| pAwareHome | 0.935 | From DRC scenario | 0.935 | From DRC scenario |
| pAccessHome | 0.1 | Reduced from baseline to reflect strain on facilities from outbreak | 0.3 | From DRC scenario |
| pTrustHome | 0.5 | From DRC scenario (same as baseline) | 0.5 | From DRC scenario (same as baseline) |
| pAwareZambia | 0.800 | From DRC scenario | 0.850 | We have slightly increased this since any added population will be in view of the Zambian health facilities while the Kasumbalesa hospital is under construction |

| | | | | |
|---|---|---|---|---|
| pAffordCare | 0.27 | From DRC scenario | 0.27 | From DRC scenario |
| pTrustZambia | 0.750 | From DRC scenario | 0.750 | From DRC scenario |
| pAccessZambia | 0.8 | From DRC scenario | 0.8 | From DRC scenario |
| pEaseCrossing | 0.8 | From DRC scenario | 0.8 | From DRC scenario |

## Table 2C Decision Tree Parameters for Kasumbalesa dry port – after construction

| Kasumbalesa dry port – after construction | | |
|---|---|---|
| Name | Probability | Probability source notes |
| pHealthNeed | 0.900 | From DRC scenario |
| pRoutineSeeker | 0.600 | From DRC scenario |
| pLocZambia | 0.300 | Dry port expected to increase non-Zambian travel through the border region |
| pAwareHome | 0.935 | From DRC scenario |
| pAccessHome | 0.4 | We have increased this to reflect visible and accessible new facility |
| pTrustHome | 0.5 | From DRC scenario (same as baseline) |
| pAwareZambia | 0.800 | From DRC scenario |
| pAffordCare | 0.27 | From DRC scenario |
| pTrustZambia | 0.75 | From DRC scenario |
| pAccessZambia | 0.8 | From DRC scenario |
| pEaseCrossing | 0.8 | From DRC scenario |

## Table 3 Decision Tree Outcomes

| Decision tree outcomes. | Seeks care in Zambia? |
|---|---|

| | |
|---|---|
| This person seeks care in Zambia because he or she has a health need, is a routine healthcare seeker, and is located in Zambia. Additionally, this person is aware of the healthcare services provided in Zambia, has access to adequate care, and trusts the Zambian healthcare providers. | Yes. |
| This person does not seek care in Zambia. This person has a health need, is located in Zambia, and is a routine healthcare seeker. This person is aware of the healthcare services provided in Zambia and has access to adequate care, but does not trust the Zambian healthcare providers. | No. |
| This person does not seek care in Zambia. This person has a health need, is located in Zambia, and is a routine healthcare seeker. This person is aware of the healthcare services provided in Zambia but does not have access to adequate healthcare (i.e. does not have access to adequate facilities, supplies, etc). | No. |
| This person does not seek care in Zambia. This person has a health need, is located in Zambia, and is a routine healthcare seeker. However, this person is not aware of the healthcare services provided in Zambia. | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker and is not located in Zambia. This person is aware of the services offered by their home healthcare system, has access to adequate healthcare, trusts their home healthcare providers, and can afford their home healthcare. | No. |
| This person seeks care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, has access to adequate care, and trusts their home healthcare providers, but cannot afford healthcare at home. This person is aware of the healthcare services offered in Zambia, has access to adequate care in Zambia and trusts the Zambian providers. This person can also easily cross into Zambia. | Yes. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, has access to adequate care, and trusts their home healthcare providers, but cannot afford healthcare at home. This person is aware of the healthcare services offered in Zambia, has access to adequate care in Zambia and trusts the Zambian providers. However, this person cannot easily cross into Zambia. | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, has access to adequate care and trusts their home healthcare providers, but cannot afford healthcare at home. This person is aware of the healthcare services offered in Zambia and has access to adequate care in Zambia but does not trust the Zambian providers. | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, has access to adequate care and trusts their home healthcare providers, but cannot afford healthcare at home. This person is aware of the healthcare services offered in Zambia but does not have access to adequate care in Zambia (ie does not have access to adequate facilities, supplies, etc.). | No. |

| | |
|---|---|
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, has access to adequate care and trusts their home healthcare providers, but cannot afford healthcare at home. However, this person is not aware of the healthcare services offered in Zambia. | No. |
| This person seeks care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system and has access to adequate healthcare but does not trust their home healthcare providers. This person is aware of the healthcare services offered in Zambia, has access to adequate Zambian healthcare, trusts the Zambian healthcare providers, and can easily cross into Zambia. | Yes. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system and has access to adequate healthcare but does not trust their home healthcare providers. This person is aware of the healthcare services offered in Zambia, has access to adequate Zambian healthcare and trusts the Zambian healthcare providers, but cannot easily cross into Zambia. | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system and has access to adequate healthcare but does not trust their home healthcare providers. This person is aware of the healthcare services offered in Zambia and has access to adequate Zambian healthcare but does not trust the Zambian healthcare providers. | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system and has access to adequate healthcare but does not trust their home healthcare providers. This person is aware of the healthcare services offered in Zambia but does not have access to adequate Zambian healthcare (ie does not have access to adequate facilities, supplies, etc). | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system and has access to adequate healthcare but does not trust their home healthcare providers. This person is not aware of the healthcare services offered in Zambia. | No. |
| This person seeks care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, but does not have access to adequate healthcare (ie does not have access to adequate facilities, supplies, etc). This person is aware of the healthcare services offered in Zambia, has access to adequate Zambian healthcare, trusts the Zambian healthcare providers, and can easily cross into Zambia. | Yes. |

| | |
|---|---|
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, but does not have access to adequate healthcare (i.e. does not have access to adequate facilities, supplies, etc). This person is aware of the healthcare services offered in Zambia, has access to adequate Zambian healthcare and trusts the Zambian healthcare providers, but cannot easily cross into Zambia. | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, but does not have access to adequate healthcare (ie.. does not have access to adequate facilities, supplies, etc). This person is aware of the healthcare services offered in Zambia and has access to adequate Zambian healthcare but does not trust the Zambian healthcare providers. | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, but does not have access to adequate healthcare (ie does not have access to adequate facilities, supplies, etc). This person is aware of the healthcare services offered in Zambia but does not have access to adequate Zambian healthcare (ie does not have access to adequate facilities, supplies, etc). | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is aware of the services offered by their home healthcare system, but does not have access to adequate healthcare (ie does not have access to adequate facilities, supplies, etc). This person is not aware of the healthcare services offered in Zambia. | No. |
| This person seeks care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is not aware of the services offered by their home healthcare system. This person is aware of the healthcare services offered in Zambia, has access to adequate Zambian healthcare, trusts the Zambian healthcare providers, and can easily cross into Zambia. | Yes. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is not aware of the services offered by their home healthcare system. This person is aware of the healthcare services offered in Zambia, has access to adequate Zambian healthcare and trusts the Zambian healthcare providers, but cannot easily cross into Zambia. | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is not aware of the services offered by their home healthcare system. This person is aware of the healthcare services offered in Zambia and has access to adequate Zambian healthcare but does not trust the Zambian healthcare providers. | No. |
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is not aware of the services offered by their home healthcare system. This person is aware of the healthcare services offered in Zambia but does not have access to adequate Zambian healthcare (ie does not have access to adequate facilities, supplies, etc). | No. |

| | |
|---|---|
| This person does not seek care in Zambia. This person has a health need, is a routine healthcare seeker, and is not located in Zambia. This person is not aware of the services offered by their home healthcare system nor is this person aware of the healthcare services offered in Zambia. | No. |
| This person does not seek care in Zambia. This person has a health need but is not a routine healthcare seeker. | No. |
| This person does not seek care in Zambia because this person does not have a health need. | No. |

## Full Decision Tree Map

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