Mapping of Malnutrition from EMR Data in Southern Haiti

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Introduction

Malnutrition accounts for 45% of all deaths of children under the age of 5[1]. In Haiti, the problem of malnutrition is especially severe, exacerbated by the 2010 earthquake and a brutal rainy season. Local mapping of malnutrition with geographical information systems (GIS) makes it possible for clinical staff to analyze geospatial patterns within their clinic's catchment area. This data can be used to determine barriers to adequate nutrition, identify areas in the most acute need, and analyze the success of particular interventions. In Port Salut, Klinik Timoun Nou Yo (KTNY) runs a nutrition program for affected children, and needs a GIS tool for tracking their patient population and accomplishing these geospatial tasks.

Objective

Design
• a GIS tool that is flexible and easy for clinical staff to operate

Function
• visualization of the geographical distribution of patients treated for malnutrition at KTNY

• act as a platform for future geospatial analyses

Effect
• allow the clinic to introduce/adjust public health programs and prepare resources effectively.

Methods

Writing the Software

• the GIS tool, called "KTNY Tracker" is written in python as a plug-in for the open source software QGIS[2].

• takes patient data from electronic medical record (EMR) database, sorts their malnutrition information into a map of the region.
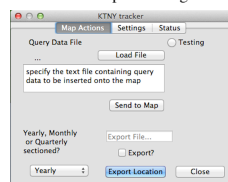

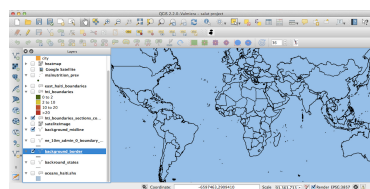Figure 1. illustrates the user interface of the mapping tool.

Figure 2. shows an example map from the core GIS software, QGIS

Testing Functionality

• with sample patient data, see if mapping process generates interpretable and/or significant output.

• test two of many possible information workflows, temporal regional distribution and absolute city distribution.

Regional Distribution Map

• patient data from 2013 and 2014 uploaded and processed by the software

• creates geographical comparison of the 2013 and 2014 patient populations at the section level[3]

City Distribution Map

• generate a map of the total patient burden seen by the clinic in a given time frame, 2013-2014, at the city level[4].

Results

Regional Distribution Map

• figures 3 and 4, output by the software, shows an increase in patient load as well as catchment area from 2013 to 2014. This is most likely due to increased awareness about the clinic and its growing reputation, as well as extended efforts of patient pickup from remote areas. This shows the increasing impact the clinic has on the surrounding community, and can serve as a visual advocate for more funding and resources for the clinic's malnutrition program.
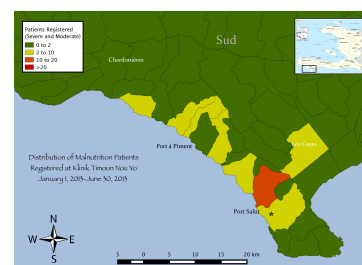

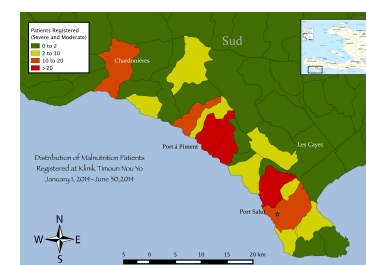Figure 3. shows the distribution of patients who visited the clinic in 2013

Figure 4. shows the distribution of patients who visited the clinic in 2014

Results

City Distribution Map

• most of KTNY's patients reside near the clinic, and along the coastline. There is a noticeable lack of patients from the north center of the Sud department, which could reflect the mountainous terrain of the area. Figure 5 shows a useful map style for visualizing patient locations at the city level.
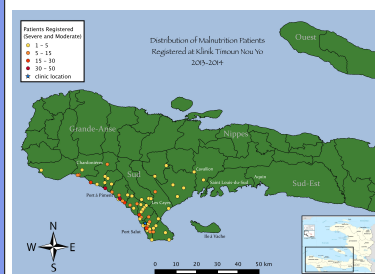

Figure 5. emphasizes the overall distribution of patients, rather than a regional comparison

Conclusion

Discussion
• KTNY Tracker in combination with QGIS's native functionality proves to be a useful tool in visualizing clinical data and requires minimal training and experience to operate.

• the software is still in development, but it has promising potential as a clinical aid and as a launch pad for further studies.

Future Goals
• assess follow-up success and failure rates in malnutrition program

• elicit access to care disparities by comparing economical, terrain, and weather data

References

1) Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. *Maternal and child undernutrition and overweight in low-income and middle-income countries*. Lancet. 2013;382(9890): 427–451.

2) QGIS Development Team, 2014. QGIS Geographic Information System. Open Source Geospatial Foundation Project. http://qgis.osgeo.org

3) Haiti Administrative Boundaries Admin Level 3. (2012, May 9). Retrieved July 1, 2014, from http://haitidata.org/layers/ cnigs.spatialdata:hti_boundaries_sections_communales_adm3_cnigs_polygon

4) Haiti Populated Places and Toponyms. (2012, April 20). Retrieved July 1, 2014, from http://haitidata.org/layers/cnigs.spatialdata:hti_location_populatedplaces_cnigs_points