

Koreisha: Web Platform to Measure Healthcare System Coverage in Chile

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ABSTRACT

To assess the performance of the healthcare system, decision makers require tools to quantify coverage, ideally in real time. We implement a methodology to measure system coverage by software, which is applied as a prototype in the city of Coyhaique, southern Chile. The current implementation use a survey that gathers sociodemographic data about the patients, and at the same time, healthcare system performance information which is related to an adaptation of Tanahashi's coverage model. Results are deployed to decision makers by means of a web dashboard that delivers system coverage measurements obtained from the survey and an analysis of the reasons that justify the failure in treatment success. The platform includes a Predictive Module which estimates system coverage for a treatment, given the patient information.

I. INTRODUCTION

The healthcare system involves multiple components and stakeholders, which creates a complex structure and interactions that difficult the measurement of performance metrics (Smith *et al.*, 2010; Zhang *et al.*, 2015). In order to tackle this issue, we present Koreisha, which is a web platform whose objective is to measure health system coverage for a set of healthcare needs (normative needs). In each case, we analyze the performance of the treatments related to the

normative need, describing the reason of failure in treatment success. So far, this structure allows us to connect patients, health system personnel and decision makers.

One of the instruments that Chile use for decision making on public health management is the National Health Survey (Margozzini & Passii, 2018). The latest comprised the period 2016-2017 and included 6233 people. Koreisha aims to improve the process of data gathering and processing in order to increase the rate of health system information. The methodology implements a digital survey, which results could be processed in real time, and be used to train a predictive model for classifying the expected system coverage for a patient. The survey measures several aspects of the patients: sociodemographic and labour history, medical variables to assess the normative need and the reasons that explains why a patient has failed in a treatment. This information allows us to create a profile that could be used, for example, to analyze equitable access to health system attention (Frenz & Vega, 2010).

The survey is implemented with the help of the Center of Geroscience, Mental Health and Metabolism (Gero)¹. They developed a platform with the ability to implement complex surveys through a graphical user interface or even by coding it with the Scheme language. The agile implementation of the instrument

made possible to apply the methodology as a prototype study in the city of Coyhaique (Aysén region, southern Chile). Together with the Health Service Management of the Aysén Region, we developed instructions to apply the Koreisha survey through the Gero platform, which allowed the health service personnel to interview the people.

II. METHODS

A. Interviews

Koreisha was applied in the city of Coyhaique with focus on senior people able to answer the survey. Besides the sociodemographic data, the survey comprises 15 health modules, each related to a normative need. This results in a long instrument whose completion took around 10 hours distributed in two sessions. The local Health Service suggested 440 potential candidates for the interview, from which 137 were actually interviewed. Finally, a group of 81 people answered the full survey.

B. Data processing

Each normative need has a set of rules that determines if the interviewee has the need or not. For example, the cognitive module comprises the results of the Montreal Cognitive Assessment test, Pfeffer Functional Assessment Questionnaire and AD8 Informant Questionnaire. If someone turns out positive in all three

¹<http://www.gerochile.cl/es/>

tests, then it is said that the person has the normative need.

Treatment coverage is measured by relating its value to the reason that an interviewee assigned to the question of why the treatment was dropped. That said, if the person answered that the treatment wasn't received because there were no professionals to treat the disease, then healthcare system failed in availability. Similarly, the stages of accessibility, acceptability and effectivity are related to other reasons available in the survey. The system provided proper care if the answer is not related to any of the previously mentioned stages.

Coverage results are used to train a supervised model, to estimate the coverage output for a treatment given the patient data. The model will give an idea to health care personnel of the stage in which the system will fail. So, preventive measures could be taken to assist the patient and increase coverage.

C. Information system

The software implements an Extract, Transform and Loading (ETL) process. We read the Gero database related to the project, which has the answers to the survey in JSON format and the questions in Scheme language representation. We parse the questions and match them with the answers which is saved as a MongoDB document. Then we compute (transform) the answers of a survey to normative need indicators and health system coverage measurements. This data is loaded to be available through a Django based Application Programming Interface (API) and to be processed by the Predictive Module. The latter results are also available through the API. A diagram of the structure of the Koreisha information system is presented in Fig. (1).

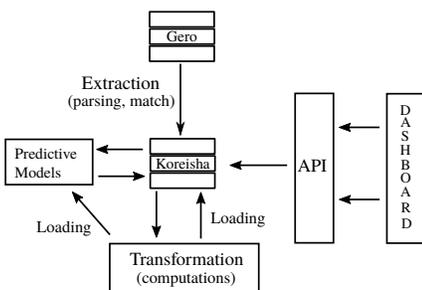


Fig. 1. Information system diagram. Extraction, transformation and loading process describe the interaction between the Gero and Koreisha databases.

III. RESULTS

Fig.(2) shows the main view of the web dashboard. It summarizes the results grouped by health module and provides tools for data and project related documents downloading. Also, the dashboard is designed to display the Predictive Module results, which full implementation to the end user is currently under development.

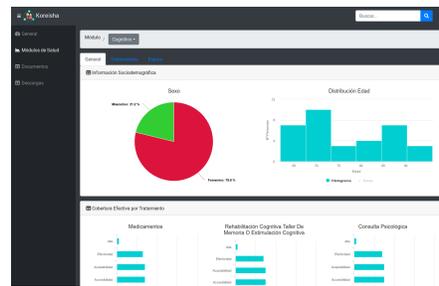


Fig. 2. General view of the Koreisha dashboard.

The information system displays the interviewees age histogram which range from 60 to 96 years old, and 75% of them were females, (Fig. 3). From the medical exams, it was measured that 9 of them had the cognitive normative need.

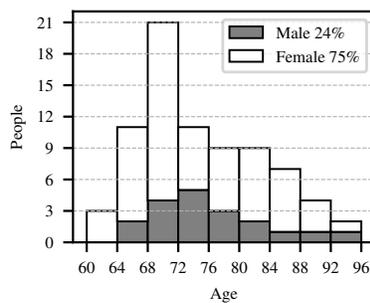


Fig. 3. Age histogram of the interviewed people differentiated by sex. Females interviewees were predominant reaching the 75% of the sample.

Fig. (4a) shows the survey coverage results for the cognitive rehabilitation treatment in the cognitive health module. Fig (4b) show the reasons for treatment abandonment. Both charts are a representation of the information displayed by Koreisha for every treatment in a health module.

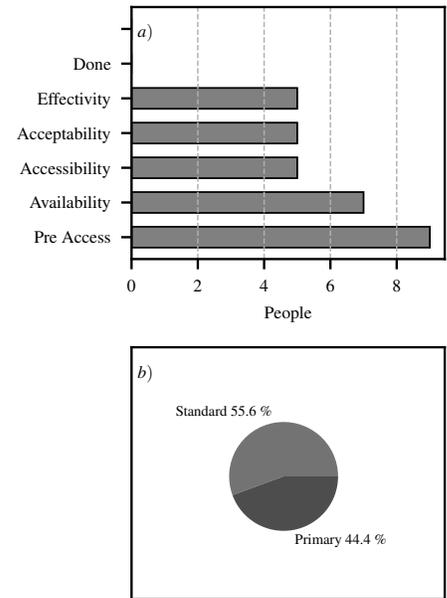


Fig. 4. Coverage results for the cognitive rehabilitation treatment in the cognitive health module: a) Coverage diagram based on Tanahashi's proposal b) Distribution of the treatment abandonment reasons.

IV. DISCUSSION

The Koreisha Platform successfully implements a methodology that transfers patient data to the decision makers and health care personnel. We acknowledge the fact that our database is still small and that a protocol for continuous data gathering should be implemented in order to advance towards real time. Eventually, the system should develop a structure like the proposed in Zhang *et al.* (2015), allowing real time interaction between multiple stakeholders and a big data environment. So far Koreisha measures health system coverage based on Tanahashi (1978). Nevertheless, we are aware that effective coverage is a more robust indicator of health system performance (Shengelia *et al.*, 2005; Ng *et al.*, 2014). Future work will be focused on improving the survey in order to make it shorter and easier to apply. Also, a relation between resources allocation and coverage indicators will be performed. This information will be useful to perform simulations whose input is based on sociodemographic parameters for a given population group and with those results, assess if the system is ready to satisfy population needs.

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