An Assessment of Healthcare Administration to Senior Citizens in Catanduanes Using Text Analysis

Ramona Michelle M. Magtangob*
College of Information and Communications Technology
Catanduanes State University
Catanduanes, Philippines
magtangobmic1001@gmail.com

Thelma D. Palaoag
College of Information Technology and Computer Science
University of the Cordilleras
Baguio City, Philippines
tdpalaoag@uc-bcf.edu.ph

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***Abstract*— As the population of senior citizens expands, challenges on how healthcare is delivered are becoming extremely important, this study aims to evaluate how the government provides healthcare services to senior citizens in Virac, Catanduanes using text analysis to enhance the programs in place that can help them manage the healthcare services provided. The research made use of the mixed-methods approach, which included qualitative and quantitative research methods to assess the healthcare administration of government to senior citizens. The machine learning text analysis was also used in this study to assess if the respondents' opinions on the services provided are positive, neutral, or negative. Based on the responses, the assessment of the healthcare administration for senior citizens is ineffective, according to the study's findings. The feelings and opinions expressed by senior citizens are based on their experiences with the services provided to them. This research suggests that the government should improve its services for senior citizens' healthcare administration, especially in the province to better meet their needs and satisfaction. This may be evident in their feedback on what services they want to receive and how they want them to be improved.**

***Index Terms*—sentiments analysis, machine learning, health-care, healthcare services, senior citizen.**

I. INTRODUCTION

Aging is a natural process that everyone faces differently. The proportion of the aging population has increased with improvements in health care and life expectancy, making them more susceptible to a variety of diseases and comorbidities [2]. The health needs and problems of older people cannot be treated separately. Medical problems are determined by a variety of factors, including lack of knowledge and understanding of illnesses, food, and nutritional needs, health care system factors, and physical contexts, and have a significant impact on the quality of life of older people [15].

Senior Citizens are residents of the Philippines who are at least sixty (60) years old, as specified by Republic Act 9994 [10]. Their demand for healthcare services is growing as the population ages. One of the countries having an aging population is the Philippines, where 7.4 percent of people were over 60 years old in 2015, and 15.9 percent predicted by 2045 [3]. These demographic trends necessitate a shift in the country's focus to addressing the senior citizen population's preventive health and medical needs. Therefore, the predicted growth in the number of senior citizens needs increased government support for healthcare and security [1].

Weak and fragmented health systems in the resource-poor setting are not fully able to provide well-designed, cost-effective, and mutually reinforcing prevention and treatment interventions [15]. Indeed, present Development Goals' health targets have dropped since our health programs are unable to meet the needs of public health campaigns and regular health care at the same time. Improving healthcare access and quality is a primary priority in growing markets like the Philippines. Government should understand that people's health is their duty, and they should be committed to improving healthcare systems, particularly for vulnerable groups such as senior citizens [1] [11].

The use of health services by seniors is becoming increasingly important as the population of older people grows, especially in the provinces. Catanduanes is an island province in the Philippines' Bicol region, part of the southeastern Luzon archipelago. The provincial administration is striving to achieve its health goals by conducting LGU-level reviews that will serve as the basis for future initiatives. A provincial health investment plan was created to evaluate the health issues, establish future objectives and strategies, educate practitioners, and track the province's health status while providing resources for execution. Despite the efforts of the provincial government, some diseases are becoming more prevalent. This means that it depends on the particular location [7] and how the healthcare issues of the people are handled.

This research, therefore, has obtained significant information about how the government delivers healthcare services to senior citizens in Catanduanes to improve the programs in place to assist them in managing healthcare services. This study addresses the gap presented that there is a need to improve the health and well-being of senior citizens by successfully implementing programs that are targeted to the unique issues that they endure and are based on well-designed programs that have been proven to be efficient and effective [8].

Text Analysis will be utilized in this study which refers to a group of approaches that employ opinion-related data to extract meaningful information. This strategy presents words as potential aspects in advance to be used to focus on the qualities of interest of the respondents [5]. This will help the study to

know the respondents' feedback on the government's healthcare administration to the senior citizens in the province of Catanduanes.

The purpose of this study was to address the following questions: (1) What is the level of agreement on the effectiveness of the Governments' healthcare administration on the senior citizens in terms of (a) health service delivery, (b) health regulation, and (c) health system performance ; (2) What is the level of assessment on provided healthcare services on the senior citizens in terms of (a) health and well- being, (b) accessibility and mobility, and (c) communication and information and (3) What is the sentiment on provided healthcare services of the government?

II. Methodology

The research made use of the mixed-methods approach, which included qualitative and quantitative research methods to assess the healthcare administration of government to senior citizens.

A. Data Collection and Gathering

The researcher interviewed staff from the provincial health department and the office of the Seniors Association in Virac, Catanduanes, to learn more about the primary healthcare administration for seniors. In January and February 2022, a descriptive technique was employed to collect primary data on seniors' perceptions of healthcare administration.

The purposive sampling technique was used in this study specifically the homogenous sampling, when the study issue is relevant to the features of a certain group of interest, this sampling technique is frequently chosen [14]. The study was conducted in the barangay San Isidro Village in the municipality of Virac since it has the most senior citizens in the municipality. Respondents in the descriptive method are 248 out of the 694 total numbers of senior citizens in the target location. This was identified using the slovin's formula. A formula was employed to calculate the confidence levels and margins of error on the sample taken from the population which were 95 percent and 5 percent respectively [4].

A questionnaire with two (2) components was employed in this research. Part I is about the respondents' personal profiles, and no statistical measures were utilized in this section. It is solely for the purpose of profiling. Part II includes the questions regarding the assessment of seniors' health care administration. This was composed of three questions, the first question focused on the level of agreement on the effectiveness of healthcare administration, and the second question focused on the level of assessment of provided healthcare services to senior citizens. Both have 3 different criteria and 10 indicators for each question. While the third question focused on the sentiments of senior citizens on provided healthcare services. This question utilized the text analysis and was used to get the opinions or sentiments of senior citizens so that the researchers can extract beneficial information.

B. Data Processing

The different techniques used to conduct this study are shown in Figure 1. During the face-to-face collection of data, the researcher presented the survey instructions and content in the local dialect to accommodate those who were not properly versed. To ensure that respondents supplied precise and reliable responses, the questionnaire was also translated into the local dialect and as requested also by other seniors. After the data collected from the questionnaires were retrieved, the data conversion or the preprocessing stage followed. Data from the questionnaires, which represented the responses of the respondents, were entered into MS Excel at this point in order to prepare for the next step. Following the data conversion, data processing is divided into two parts: the first is the Likert scale process, which includes questions 1 and 2. The responses of the respondents for questions 1 and 2 were rated on a five-point Likert Scale. Table I shows the five-point Likert scale used in the questionnaires for the criteria evaluated in the assessment of health care for the elderly. From strongly disagree to strongly agree for each criterion on the first question to represent if they agree on how effective the healthcare services provided and from fair to excellent on the second question to know if they achieved in providing needed support on healthcare services to senior citizens. Statistical analysis was performed using frequency enumeration and weighted mean statistics. The mean score was used to compute the descriptive equivalent.

Text analysis, which is for the third question, is the second part of data processing. To interpret the human language in the feedback, the researcher used the no-code artificial intelligence or AI platform MonkeyLearn. It is an easy-to-use AI platform that helps users get started with natural language processing or NLP by providing already trained models or allowing them to create custom models that meet their specific needs [12]. This application is a rental product that includes an online text and sentiment analyzer based on machine learning, or it is a software as a service known as SaaS [17]. Pre-trained text analysis model of MonkeyLearn application was used in this study. This pre-trained machine learning text analysis was used for unsupervised classification. It was presented as a classification task in which a classifier was given a text and instructed to categorize it into one of three polarities, which are positive, negative, or neutral categories. This application has a model that matches a given input, such as text data, with the appropriate output, such as a tag. The method transforms the text into a vector of features. A machine learning approach was used to build a model with positive, negative, and neutral extracted features and tags. The feature extractor is used in the prediction process to convert unseen text input into selected features. The model that predicts tags such as polarity categories uses these feature vectors as input (positive, negative, or neutral) [6].

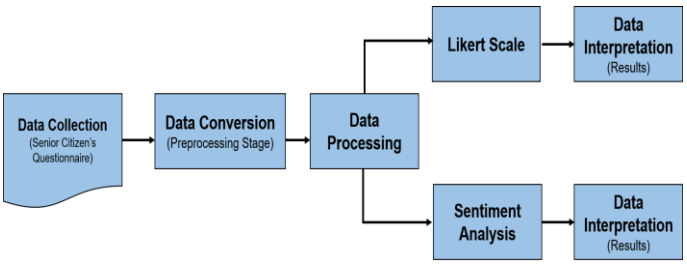

Fig. 1. Data Processing Diagram

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Table I. Five-Point Likert Scale for Assessment of Healthcare Administration for Senior Citizens

Point Score	Range *Interval*	Descriptive Rating	
		Level of Agreement	***Level of Assessment***
1	1.00-1.79	Strongly Disagree	Poor
2	1.80-2.59	Disagree	Fair
3	2.60-3.39	Neutral	Satisfactory
4	3.40-4.19	Agree	Very Satisfactory
5	4.20-5.00	Strongly Agree	Excellent

The integration of MonkeyLearn's machine learning classifier into this study is depicted schematically in Figure 2. The percentage of confidence assigned to each feedback is determined by the polarity assigned by the trained model. Figure 3 shows classification examples for each polarity.

III. Results And Discussion

The major reason for this paper is to evaluate the healthcare administration to senior citizens in order to determine if the services are being given as specified in the survey questionnaire.

A. Agreement on the Effectiveness of Government's Health-care Administration

The first problem addressed in this study inquiries the level of agreement on the effectiveness of the government's healthcare administration to senior citizens in terms of (a) service delivery, (b) health regulation, and (c) health system performance. Table II shows the result of the first question in the survey conducted on selected senior citizens in Catanduanes. It shows that the service delivery, health regulation, and health service performance received nearly the same score or mean answer from the respondents,

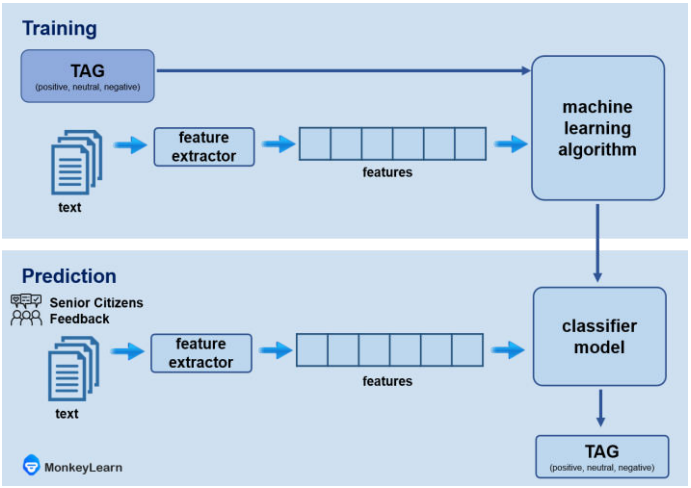

Fig. 2. MonkeyLearn's Machine Learning Classifier Adapted

Which is equivalent to neutral, based on the findings of three criteria. These criteria were selected for this problem since it is one of the most important matters in this area. Good service delivery, health regulation, and health performance were important factors in every healthcare system.

Based on the responses collected the outcomes of the ratings for service delivery, which include comprehensiveness, ac- accessibility, and coverage; health regulation, which focuses on the specific regulations for senior citizens' health; and health system performance, which emphasizes continuity, quality, person-centeredness, and coordination, show that they neither agree nor disagree on the effectiveness of the government's healthcare administration, which was also based on the results of the survey. It has a total weighted mean of 2.63 which is also equivalent to neutral.

B. Assessment of Provided Healthcare Services

The second problem posed in the study seeks to assess provided healthcare services to the senior citizens in terms of (a) health and well-being, (b) accessibility and mobility, and (c) communication and information. In terms of the services provided by the government, accessibility and mobility ranked 1st with a weighted mean of 2.32, communication and information in 2nd rank with a 2.20 weighted mean, and health and well-being in the 3rd rank with a 1.88 weighted mean. All criteria presented on the healthcare services provided to senior citizens were equivalent to fair, according to their ratings. Table III shows the result of the assessment for the second problem.

The criteria used to evaluate the healthcare services provided to senior citizens mostly focused on the services delivered to respondents. This includes guidance and support for their health and well-being, as well as guidelines on how to get access to various services. Also, the availability of technology that would allow them to move around more easily, as well as arrangements on how the information would be sent to them and the availability of easy communication. The total weighted mean for the criteria was 2.14, which was considered fair.

C. Text Analysis Used in the Study

The final question is about how senior citizens feel about government-provided healthcare. The intention of this question is to learn about their feelings and thoughts about the government's healthcare services.

Table II. Agreement on the Effectiveness of the Government's Healthcare Administration to Senior Citizens

Criteria	Weighted Mean	Quantitative Rating	Qualitative Rating
Service Delivery	2.57	3	Neutral
Health Regulation	2.67	3	Neutral
Health System Performance	2.65	3	Neutral
Total Weighted Mean	**2.63**	**3**	**Neutral**

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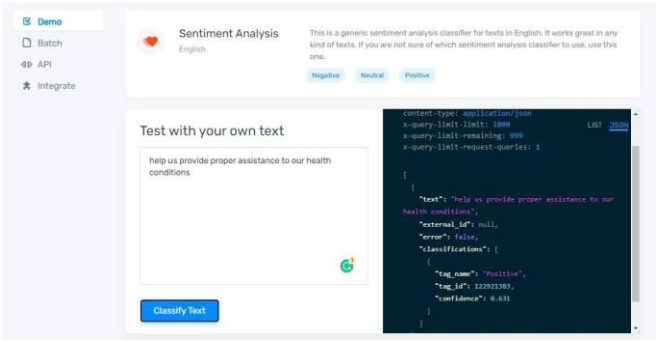
Table III. Assessment of the Provided Healthcare Services to the Senior Citizens

Criteria	Weighted Mean	Quantitative Rating	Qualitative Rating
Health and well-being	1.88	2	Fair
Accessibility and mobility	2.32	2	Fair
Communication and Info	2.20	2	Fair
Total Weighted Mean	**2.14**	**2**	**Fair**

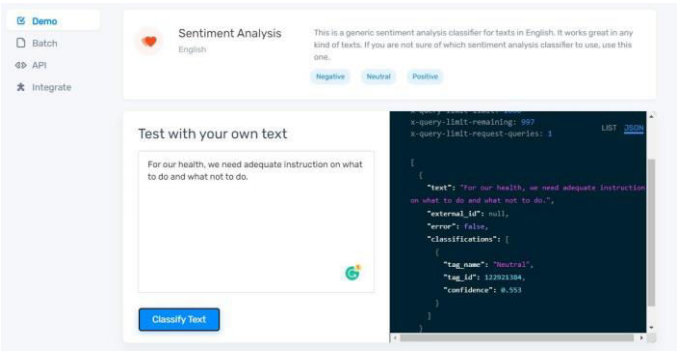
Their assessment was based on their prior experience with the services in question. Figure 3 provides examples of classification for each feedback provided by the respondents. It is divided into three categories: positive, neutral, and negative. Figure 3 (a) shows an example of positive feedback with a 0.631 confidence level, which says" help *us provide proper assistance to our health condition."* There are other sample responses under the positive feedback which include" support *all seniors with their health issues";" ensure that health services are safe";" provide seniors a simple fitness and wellness plan";" focus on senior health interventions";" good communication with medical professionals and facilities"; and" make use of technology to improve the healthcare service".* The next example, shown in figure 3 (b), has a confidence level of 0.553, which is equivalent to neutral, and states that" for *our health, we need adequate instruction on what to do and what is not to do".* Some other neutral responses are" proper *scheduling at the center so that seniors don't have to wait in line for long periods of time";" using technology to speed up health-care transactions";" create ways for seniors to receive the right treatment in order to avoid sickness"; and" change the quality of the health programs,".* Finally, figure 3 (c) shows a 0.929 confidence level, which is equal to negative and states" lack *of properly addressing the long process of elderly health programs".* Negative responses from other seniors also state *" service provided to seniors is not good";" no monitoring of seniors' health and wellness";" no immediate relief for non-serious illness";" no guidance for the right foods when we are sick";" lack of quick health assistance";" no technology to facilitate the process"; and" unable to educate us and family members of what to do in the event of a sudden illness".* These are some of the responses from the 248 senior citizens that took part in the survey.

In analyzing the responses, the researcher found that 83.1 percent, corresponding to 206 feedbacks, was negatively polarized, followed by 10.5 percent, or 26 feedbacks, with positive polarity, and 6.5 percent, corresponding to 16 feedbacks with neutral polarity. Figure 4's pie chart shows the proportion of polarity described for each segment.

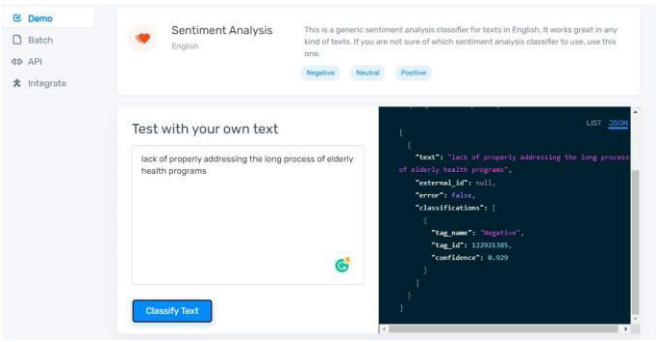
Following the polarity analysis, the researcher used the tag words or the word clouds to extract keywords to assess the positive, neutral, and negative components of thoughts on senior health care, as shown in Figure 5. MonkeyLearn's AI-assisted word cloud generator was used in this study to illustrate the frequency and importance of the keywords. The relevance score is a formula that takes into account the frequency of keywords as well as other factors such as word length and descriptiveness citeb18.



(a) Example Result of Positive Feedback



(b) Example Result of Neutral Feedback



(c) Example Result of Negative Feedback

Fig. 3. Interface of the MonkeyLearn classification model: (a) Positive, (b) Neutral, and (c) Negative tags

Figure 6 (a) shows the keywords with positive polarity derived from the feedback, which include*" safe health services"," quick communication", and" proper coordination".* These common and relevant keywords reflect what the respondents said about their health and the services offered to them. In figure 6 (b), the keywords retrieved from the feedback with neutral polarity are shown which include" proper *health processes"," older health programs", and" quality of health services".* We can assess effective health processes and previous health programs in the healthcare services depending on those with higher frequency and relevance. This portion of respondents had neutral opinions based on their experiences with the government's health care services. Figure 6 (c) shows the keywords derived from

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negative polarity feedback such as" lack *of support"," lack of system"," insufficient process", and" lack of help"*, among others. We can conclude from those with the highest frequency and relevance that senior citizens have negative thoughts about the healthcare services they receive. They have expressed dissatisfaction with the lack of proper procedures, health programs, support, and the technologies employed to help them, which was based on their experiences.

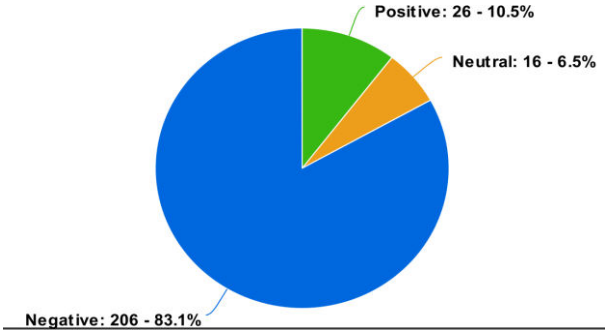


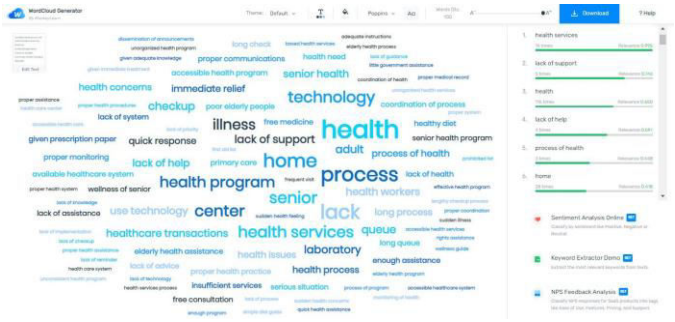
Fig. 4. Senior Citizen Feedback's Polarity

According to the results of the study, healthcare administration for senior citizens is ineffective, based on the respondents. Senior citizens' feedback reflects their feelings and opinions based on their experiences with the services that are provided to them. The response was written based on their thoughts, which were then subjected to text analysis. According to the approach used, 83.1 percent of this feedback has negative polarity. This result explains and supports the findings from questions 1 and 2 regarding why respondents have a high level of sensitivity to the healthcare system. Other factors that received comments included effective health monitoring and guidance, technology to help with processes, insufficient service, and mobility issues, all of which influenced their perceptions of the services offered to them.

Fig. 5. Word Clouds Extracted from the Sentiments of the Senior Citizens

(a) Positive Keywords on the Opinions of the Senior Citizens

(b) Neutral Keywords on the Opinions of the Senior Citizens



(c) Negative Keywords in the Opinions of the Senior Citizens

Fig. 6. Extracted keywords from feedback by polarity (a) positive, (b) neutral, and (c) negative using the word clouds

IV. Conclusion

In this study, the researcher used a questionnaire to evaluate the health care of seniors using a five-point Likert scale and text analysis. An attempt was made to show whether the result of the five-point Likert scale matched or supported the result of the text analysis. It was shown that text analysis techniques can successfully identify free-text comments from seniors about the health care services provided to them based on their experiences. The results support the outcome of the five-point Likert scale. The results show how respondents rate the performance given to them in providing services. Significant correlations were also found between respondents' opinions of health care quality. This research suggests that the government should improve its health administration services for seniors to better meet their needs and satisfaction. This is evident in the respondents' feedback on what services they would like to receive and how they would like to improve them. Medical issues such as illness risk factors awareness, dietary and nutritional requirements provision, and improved health system services have a substantial impact on the quality of life of seniors. At the same time, this study has significant limitations that could lead to further progress and research. First, the researcher only studied the feedback/comments based on the questionnaires because the respondents requested it. In the future, seniors' opinions on social media and the Internet could be evaluated for other results. Second, based on the negative feedback, a better health care system can be developed to better address and support seniors' concerns and improve the government's provision of health care services. This would help the government improve its strategy to provide an adequate health care system while supporting the needs of

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seniors. This will ensure that seniors receive the attention they deserve and that data on their health status is updated quickly. This will demonstrate that an adequate health system is a priority not only in urban areas of the country but also in the provinces.

V. Acknowledgment

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References

[1] Alipio, Mark M., and Pregoner., Joseph Dave M." Determinants of healthcare utilization among senior citizens in Davao City, Philippines." JPAIR Multidisciplinary Research Journal 39.1 (2020): 1-1.

[2] Boutayeb, Abdesslam, and Saber Boutayeb. "The Burden of Non- Communicable Diseases in Developing Countries". International journal for equity in health 4.1 (2005). https://doi.org/10.1186/1475-9276-4-2

[3] Cruz, Grace T., Cruz, Christian Joy P. , and Yasuhiko Saito. " Ageing and Health in the Philippines." Economic Research Institute for ASEAN and East Asia – ERIA, 2019.

[4] Ellen, S." Science and Education: Slovin's Formula Sampling Technique". https://www.ehow.co.uk/way5475547slovins-formula-sampling- techniques.html. Accessed 11 Feb. 2022

[5] Koupaei, Diba Malekpour, et al." An assessment of opinions and perceptions of smart thermostats using aspect-based sentiment analysis of online reviews." Building and Environment 170 (2020): 106603.

[6] "MonkeyLearn - Sentiment Analysis: Guide". https://monkey learn.com/sentiment-analysis/. Accessed 1 Mar 2022.

[7] Panti, Marilyn B." Health Status and Programs Implemented by the Provincial Government of Catanduanes in Bicol Region, Philippines." Open Journal of Social Sciences 8.5 (2020): 419-431.

[8] Phang, Chee Wei, et al." Senior citizens' acceptance of information systems: A study in the context of e-government services." IEEE transactions on engineering management 53.4 (2006): 555-569.

[9] Prohaska, Thomas, et al." Physical activity, public health, and aging: critical issues and research priorities." The Journals of Gerontology Series B: Psychological Sciences and Social Sciences 61.5 (2006): S267- S273.

[10] Republic Act No. 9994: GOVPH (2010) Official Gazette of the Republic of the Philippines. https://www.officialgazette. gov.ph/2010/02/15/republic-act-no-9994/ Accessed 3 May 2022.

[11] Reyes, Celia M., Arkin A. Arboneda, and Ronina D. Asis. Silver linings for the elderly in the Philippines: Policies and programs for senior citizens. No. 2019-09. PIDS Discussion Paper Series, 2019.

[12] Roldos, I."MonkeyLearn: NLP, AI, and machine learning: What's the difference?". https://monkeylearn.com/blog/nlp-ai/. Accessed 28 Feb 2022.

[13] Routray, Preeti, Chinmaya Kumar Swain, and Smita Praya Mishra. " A survey on sentiment analysis." International Journal of Computer Applications 76.10 (2013).

[14] Saunders, M., Lewis, P., and Thornhill, A. Research Methods for Business Students. 6th ed. Pearson, 2012.

[15] Shrivastava, S., Shrivastava, P., and Ramasamy, J.. " Health care of elderly: Determinants, needs, and services." International journal of preventive medicine 1.1 (2013): 1224-5.

[16] Stecanella, B. "MonkeyLearn: Tutorial on sentiment analysis with Python". https://monkeylearn.com/blog/sentiment-analysis-with- python/. Accessed 1 Mar 2022.

[17] Wolff, R. "MonkeyLearn Blog: Sentiment Analysis and Machine Learning". https://monkeylearn.com/blog/sentiment-analysis-machine- learning/. Accessed 15 Feb 2022

[18] Wolff, R "Visualize sentiments in a word cloud: Free tools and tutorial" MonkeyLearn Blog. https://monkeylearn.com/ blog/word-cloud- sentiment-analysis/. Accessed 13 Mar 2022