GPH-M-1: Sustainable Health Economy (WS23/24)

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Data Visualization Final Exam Project

Understanding the Living Arrangement and Socioeconomic Status of Older Adults in the eight countries in the Balkan Region

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1. <u>**Use case:**</u>

The choice of living arrangement (LA) for older adults depends on individual preferences, health status, resources, and, most importantly, financial status (UN, 2022). Older adults must consider their needs and preferences when choosing an LA for the best outcome. The current situation of older adults, particularly those related to LA, is seldom discussed in public and is not part of the agenda in the Balkan region. As a result, there is a low level of awareness. The visualization data in this project will portray the LA trends of some Balkan region countries, respectively, Kosovo, Albania, Bosnia and Herzegovina, Montenegro, Serbia, North Macedonia (previously Macedonia), Romania, and Slovenia (UN, 2024).

Visualization data can be beneficial when there is a lack of awareness among the general population regarding the current status of LA in older adults. The Balkan region is an example of such a situation, with most countries having been low-income until recently, now ranked middle to upper-income countries (World Bank, 2021) and having a long history of conflicts. This is crucial because certain LA are challenging for a good quality of life, and it is essential to bring attention to these issues. Since there is a lack of an organized database in the Balkan region, and considering the information from the UN, I decided to create a visualization tool to provide easily accessible information and raise awareness.

In the Balkan, the situation of older adults is not well visible, and there is an ongoing and increasing trend of older adults living alone. Living arrangements play a crucial role in healthy aging, and as documented, living alone for older adults faces many challenges. According to Bolina (2021), the environment in which seniors live impacts considerably their quality of life, including physical, emotional, and mental well-being (Bolina, 2021). Similarly, according to Westergren et al. (2014), older adults who live

alone are at a higher risk of malnutrition, falls, and chronic illnesses. In contrast, a supportive and safe LA can help seniors maintain independence, social connections, and overall health (Bolina, 2021).

Stakeholders such as the personnel involved and closely working to protect older persons, like NGOs, governmental institutions, social protection agencies, and the academic research community, can benefit significantly from the visualization data of the older adult's LA. By understanding the LA of older adults, stakeholders can identify areas where support is needed to improve the quality of life for older adults and develop targeted interventions. In addition, the academic research community can benefit from and use this data to identify the living patterns of LA and research the relationship between LA and health outcomes and possible effective interventions to improve the living conditions of older adults.

Another important stakeholder is the media, which can use the information to raise awareness of the LA of older adults in the Balkan region. Overall, the visualization data of older adults' LA can provide valuable insights for stakeholders to make informed decisions and develop effective policies and programs to improve the well-being of older adults.

2. Solution:

The lack of official figures and statistics on older adults' living arrangements is a challenge in the Balkan region and a significant global issue. The elderly population is growing worldwide, and with the increasing number of chronic conditions, it is crucial to have reliable data to develop targeted interventions that can improve their health and well-being. Official figures for the older adults living arrangements from the countries in the Balkan region are either not available or, if available, they are not easily accessible. In addition, there is a lack of official websites and statistics on the living arrangements of older adults in this region.

In addition, the lack of data on the living arrangements of older adults in the Balkan region limits stakeholders' interventions and their involved in understanding the current living arrangements in this area, challenges related to living arrangements, the lack of services, and most importantly, the negative effects on healthy aging. Without access to reliable data, it becomes difficult to understand the current living arrangements, concerns, and needs of the elderly population in this region. This, in turn, hinders the development of targeted interventions that can help these age groups achieve better outcomes and lead healthy and independent lives. Moreover, with the number of people living longer and having more chronic conditions on the rise, the need for interventions for healthy and independent aging has become more critical than ever.

To address this challenge, my solution for the Balkan Region countries is that I have created a visualization tool for older adults living arrangements using the publicly available data from the United Nations website. https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa_pd_2022_living-arrangements-older-persons.xlsx. The United Nations has been collecting data from various sources like international and national surveys, and government official figures for many years. They have created a global database on the living arrangements of older adults worldwide, including the Balkan region countries. This database when used correctly and converted into a visualization and interactive tool allows stakeholders to access reliable information about living arrangements of the elderly population and make informed decisions to help the elderly population achieve better outcomes.

The United Nations database on living arrangements of older adults includes information on factors like household size, age of head of household, basic household type, and intergenerational household type. This information can help stakeholders (Rupper et al., 2015) in the Balkan region understand the living arrangements of older adults in their countries and develop targeted interventions to address their concerns at a regional level as well. Using the United Nations data, stakeholders can also compare

the living arrangements of older adults in the Balkan region with other countries worldwide and identify best practices that can be adapted to the Balkan area.

I have created an interactive visualization tool that uses information from the United Nations living arrangements database to show the patterns of living arrangements in Balkan countries. All stakeholders can access this data in older adults' living arrangements, and the tool allows users to interact with the information. By using this tool, stakeholders can raise awareness about the challenges faced by the elderly population and develop targeted interventions to improve their well-being.

The visualization tool includes charts and graphs, allowing users to visually explore the living arrangements of older adults in the Balkan region. This can help stakeholders identify patterns in the data and develop targeted interventions to address the specific needs of the elderly population in each country (Zakkar & Sedig, 2017). The visualization tool should help inspire stakeholders in the Balkan region to create innovative solutions to address the challenges faced by the elderly population.

In conclusion, the need for more official figures and statistics on the living arrangements of older adults is a significant challenge in the Balkan region. To address this challenge in the Balkan region, my solution is to use the publicly available data from the United Nations website using visualization data that allows stakeholders to access reliable information and develop targeted interventions to improve the well-being of the elderly population. By using this solution, stakeholders can make informed decisions, raise awareness about the challenges faced by the elderly population, and develop innovative solutions to address their concerns.

3. **Implementation:**

This data visualization project presents the development and refinement process of a Shiny app that has been created to delve into the living arrangements and socioeconomic status of older adults in the Balkan region. The app has been designed to offer an interactive platform for users to explore insights derived from a

comprehensive dataset. The app's development involved extensive use of the R programming language and various libraries. The paper outlines the intricate steps involved in data preprocessing, tab organization, and iterative improvements made to enhance the app's functionality and user experience. Here, I will discuss the challenges I faced during the development process and how I overcame them. I will also describe the various techniques I used to ensure the accuracy and reliability of the data. This visualization project highlights the importance of careful planning, attention to detail, and iterative improvements to create a user-friendly, practical app.

I started by working and loading essential R libraries that will help manipulate data, visualize it, and develop the Shiny app. Once the libraries are loaded and the Excel file is loaded (the Excel file is obtained from the UN public data access), data cleaning began. While some of the data cleaning was done manually, removing extraneous columns and fixing column names was done in code. After the cleaning process was complete, I extracted the relevant data subsets that represent different aspects of older people's living arrangements. These subsets include household size, age of head of household, basic household type, and intergenerational household type. This marks the initial stages of the app's development.

The user interface has been carefully organized into several tabs, each with a specific focus. The first tab is the Homepage, which provides an overview of the app's purpose and how to use it. The Household Size tab allows the user to input their preferred household size range and view the corresponding distribution of households. The Age of Head of Household tab enables users to select an age range and visualize the distribution of households headed by someone within that range. The Basic Household Type tab lets the user choose a household type, such as a single-person household or a couple household, and view the corresponding distribution. Finally, the Intergenerational Household Type tab allows the user to choose the type of intergenerational household, such as parent-child or grandparent-child, and view the corresponding distribution. Users can navigate to these tabs easily to input their

preferences and visualize the outputs to understand them more easily. This intuitive design aims to make the analysis experience user-friendly and efficient.

Progression from Initial Concept to Completed Version: the development journey of the app was a process of constant refinement, marked by iterative improvements aimed at enhancing its efficacy. The initial step I worked on was data-cleaning iterations, identifying inconsistencies, and optimizing column names to ensure data accuracy and consistency. Here, I had to clean the missing data carefully since some countries were missing the information from certain years, and the other countries started collecting the data later. Some of the information from the original UN data sheet was not necessary for my project, and those were removed. Ideally, this data cleaning would have been done in code, but issues arose, as described later. Furthermore, I continued enhancing data visualization by fine-tuning plot aesthetics and color schemes and experimenting with various color schemes and graph types to identify those that are most user-friendly and effective in clearly communicating the data. The evolution from the initial concept to the completed version reflects the dedication to continuous improvement and the best final product. I believe that, as a result, this project product is an app that meets the needs of its users, providing them with a seamless and intuitive experience.

Challenges: During the initial phase of this project, I encountered significant challenges related to the density and complexity of the dataset. The data set in its original state presented difficulties in processing the information efficiently within the code. Additionally, to add to these challenges, some countries, such as Kosovo, have created unique problems due to historical factors. Kosovo, being a recently formed country that suffered a war in the 90s, lost a significant amount of data, unfortunately this further complicated the already complex situation.

To overcome these issues, I had to make strategic changes during data cleansing, applying manual data cleaning. One of the key modifications was to reduce the data set to include only both genders, a specific age range of 65 years and older,

and the most recent date available. This decision was essential to simplify the data set and make it more manageable for subsequent coding processes. I encountered another obstacle when trying to standardize the data format across the board. Despite my efforts, converting to a standard format, such as mm/dd/yy, proved highly challenging. Due to these unforeseen issues, I decided to exclude any date-related functionality in the final implementation. However, it is essential to mention that data covering information on all genders and individuals over 65 are explicitly included in the descriptions accompanying each graph. This strategic adaptation underscores the importance of acknowledging and working within the constraints imposed by the dataset.

Furthermore, I found that the data set did not follow a conventional format, with main headings divided into subheadings, adding more challenges to the already complex project. To solve this problem, I removed leading rows, defined specific column headers, and categorized columns into relevant subcategories. This particular approach made it easier to create multiple bar charts/graphs from the same data set provided. Ideally, I would have preferred a more versatile structure that easily adapts to other data sets. This experience highlights the importance of designing code with modularity and reusability in mind, and future iterations of the project may explore alternative strategies to achieve this goal. In addition, I had issues with Shinyapps.io deployment, I encountered difficulties when attempting to create an HTML browser for the app. During the execution, the app seemed to be stuck in an infinite loop, causing an extended runtime. Despite multiple attempts to address this issue, a resolution has proven elusive. If I had more time, I would probably overcome this obstacle.

Overcoming these challenges, including the unique difficulties of the newly formed country with missing history in regions such as Kosovo, and adapting to the complexities of the data set contributed significantly to my learning experience and have trained me to be prepared for unforeseen issues and challenges in the future. It taught me the importance of creatively solving unusual problems, being readily adaptable in

the face of unexpected obstacles, and, most importantly, the significance of designing code structures that can be easily applied to diverse data sets for future scalability.

Conclusion

This visualization project concludes that a visualization tool was created to explore the living arrangements of older adults in the Balkan region. The visualization tool development was an iterative process based on user feedback and optimization. The app offers a valuable tool for stakeholders such as policymakers, researchers, and anyone interested in understanding the region's demographics. The development process encountered several challenges, including data cleaning, feature engineering, and interactive visualization design. However, these challenges were overcome through a continuous commitment to optimization. The app's strength lies in its visualization capabilities, allowing for easy comparisons between different regions and living arrangements. The app's functionality also allows for exploring various demographic factors such as age, gender, and family size, providing a comprehensive picture of the living arrangements of older adults in the region. In conclusion, this academic exploration contributes to the discourse on data visualization tools in social demographics. The app's comprehensive and informative representation of the complex demographic data makes it an essential resource for researchers, policymakers, and anyone interested in understanding the living arrangements of older adults in the Balkan region.

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