Side Effects of National Immunization Program: E-Governance Support Toward Seniors' Digital Inclusion

Magdalena Ciesielska
Gdańsk University of Technology
magdalena.ciesielska@pg.edu.pl

Nina Rizun
Gdańsk University of Technology
nina.rizun@pg.edu.pl

Anna Baj-Rogowska
Gdańsk University of Technology
anna.baj-rogowska@pg.edu.pl

Abstract

In response to the coronavirus pandemic, the European Union (EU) governments develop policies to regulate exclusive health protection actions that consider societal needs with the emphasis on elders. Given that the EU vaccination strategy uses a centralized ICT-based approach, there is little guidance on how seniors are included in national immunization programs (NIP). In this paper, we addressed a knowledge gap of the side effects of e-governance of NIP for the elderly. To fill this gap, we identified 40 side effects by analyzing online textual opinions (tweets, comments, articles) that express public perception regarding the results of the Polish NIP implementation to seniors' digital inclusion, categorized them into 8 categories and assign them to four e-governance functions. The main contribution of this paper is a better understanding of the digital divide and to provide guidelines for government policy improvement.

1. Introduction

As the Covid-19 pandemic hit European Union (EU) countries, governments faced an undoubted challenge to provide public value, under a fast response time and strict social supervision. The benefits of e-government such as transparency, functionality, accessibility [1], efficiency, effectiveness, service quality, interoperability [2] have never been tested on a large scale by societies. Since seniors are the most affected group by the Covid-19 [3] it is substantial to satisfy this social group's need regarding health protection. Health statistics indicate around 80% of the deaths due to Covid-19 occur in the 65+ group [4]. Moreover, social isolation mostly affects seniors [2]. In consequence, technology became the source of contact of elders with the external world, and governments face challenges to reflect changes in social relations between government and citizens [5].

In response to the Covid-19 pandemic, governments create policies, constitute exceptional regulations, governing and managing actions to protect citizen health. Despite the effort, vaccine rates are still low, and far from desirable, and the effectiveness of EU Member States vaccination policies vary [6]. Countries such as Denmark, Ireland and Spain, manage to immunize (first dose) all 80-year-old citizens. The slower vaccination process characterizes Poland, Latvia and Bulgaria, p.e. in Poland only 58.2% (60+), and 58.6% (80+) seniors received the first dose [7]. Having in mind that the EU immunization strategy is based on a centralised, ICT-based approach, there is little guidance on how the public policy includes seniors in national immunization programs (NIP).

Based on the above motivation, the main objective of this study is to provide insights into the side effects of NIP concerning e-governance to support the digital inclusion of elders. The research objective is investigated by the following research questions (RQ): 1) What are the side effects of the national immunization program for seniors? 2) How are the side effects of national immunization program for seniors grouped into categories? 3) Which e-governance functions respond to the side effects of the national immunization program for seniors? To answer these research questions, we adopted a twofold approach, including analytics-driven (topic modelling) and expert analysis methods. To identify side effects of NIP of seniors, the case study of Polish Covid-19 vaccination program experience, discussed on Twitter, Polish news, and medical portals, is used. As a result, this study provides 40 side effects of the NIP of elders exclusion grouped into 8 categories and analyzed versus e-governance functions. This paper contributes to a better understanding of issues influencing seniors' exclusion that emerged in the process of NIP implementation and to provide guidelines for such program's improvement.

The structure of this paper is as follows. Section 2 provides a theoretical background on the

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digital exclusion of seniors and governance of Covid-19 pandemic for elders. Section 3 includes the methodology adopted in this study. Section 4 presents the results. Section 5 provides discussion, while Section 6 concludes the study.

2. Background

This section provides a background to a study based on the literature review including the digital exclusion of seniors (Section 2.1), and governance of Covid-19 pandemic for seniors (Section 2.2.).

2.1. Digital exclusion of seniors

Technological development facilitates the provision of public services, however one of the main side effects of ICT use is the digital divide [8]. OECD [9] defines the digital divide as "*the gap between individuals, households, businesses, and geographic areas at different socioeconomic levels with regards both to their opportunities to access ICT and to their use of the Internet for a wide variety of activities*". Scholars point to a broad range of socio-economic factors lying at the fundamentals of the digital divide such as age, low income, education level, sex, race, social class, employment status, literacy level [11]. However, the digital divide caused by age has become a particular issue of scientific investigation [12]. On one hand, seniors constitute 20.3% of the EU society [13], becoming one of the largest target markets for e-services and beneficiaries of e-government [14]. Conversely, seniors demonstrate a low interest in digitalization and Internet use [15], and technological adoption lag is high [14]. Scholars identify multiple reasons for not using the e-government services by the elders including lack of Internet access [16], complex usage [19], the necessity to learn [19], fear of technology and security [20], social isolation [14] and limited awareness of the e-government benefits, lack of trust [20]. Thus, mitigating the effects of the digital divide among seniors, the government's focus is on the provision of accessibility, awareness building, socialization techniques, training and motivational programs [22].

2.2. Governance of Covid-19 pandemic for seniors

The ability of the State government to cope with unexpected and risky issues [23], and to satisfy high expectations of public and various institutions [24] is crucial. The e-governance concept [25] includes e-government service provision, forcing a new style of leadership [26], new transactional processes [27], new information distribution, building societal engagement [28], and adoption of citizen-centric approach [29].

Global pandemic resulted in the rapid rise of e-health due to the lockdown constraints, and adoption of the centralized immunization distribution system [30] due to the limited supply. In the EU the vaccination is governed within the Member States' legal frameworks following NIPs. According to [31] the Member States are to set a centralised structure toward the vaccination distribution, to set a central point of contact, to provide clear and timely access through relevant media to information, to ensure Electronic Immunisation Information System or vaccination registries are in place, and to institute recall system. The vaccination process for elders (60+) defined as a priority group follows the order of immunizations announced by the State government [30] and is heavily supported by e-health [32]. Even though the advantages of e-health are known [33], its effectiveness is impeded since 40% of seniors lack the skills to use telehealth resources [34]. While seniors are only passive users of mobile phones [35], and the main driver for seniors' Internet usage is performance expectancy [36], the inclusion is facilitated by the design of a user-friendly interface [17], bringing comfort and trust [33], and use of telehealth platforms, promising inclusion of rural populations [37]. The above means are proven to be missing the point since the digital divide in health is widening due to environmental, social, economic, political and community contexts [38].

Summing up, the global pandemic has revealed the importance of digital inclusion of elders since seniors are (1) highly represented group in national demographics of the EU member states, (2) mostly endangered to Covid-19, and (3) vulnerable apart from the national health protection system due to the digital exclusion, which is particularly aggravated by the transfer of the majority of medical services to e-health during the pandemic. Moreover, since the Covid-19 pandemic is not globally under control, governments still seek effective levers and tools for adaptive governance and adjustment of emerging side effects of national politics.

In this context, our analysis of the literature revealed the following knowledge gaps: (1) despite the active use of public opinion for the government policy shaping, no in-depth research has been carried out to identify the side effects of the NIP's implementation among seniors based on freely available online textual comments, opinions, reviews, articles; (2) despite the well-known recognition of the digital divide's phenomena regarding e-government services and the requirements for social inclusion policies, as to date

there are no guidelines to e-governance and counteracting of such side effects of NIP's implementation for elders.

3. Methodology

This section aims to describe the research methodology adopted in the current study. Section 3.1. provides information on the method of the case study data collection. Section 3.2 describes the data analysis.

3.1. Data collection and preparation

To identify the core side effects of the NIP regarding for seniors, Polish Covid-19 NIP's experience is selected. Three-fold data sources are adopted to gain a full understanding of the successes and challenges faced by the e-government to include seniors into the vaccination process: (1) Twitter (public tweets); (2) Polish news portals (public comments)[1], and (3) Polish medical portals (public articles, reviews, interviews)[2]. The choice of Polish experience as a research object of Covid-19 immunization program, and the specific social media set as a data source of our study, is motivated by several factors.

First, according to statistics: (i) Poland is a typical example of an aging society where median age in 2019 was 41.3 for men and 42.6 for women[3]; (ii) around 80% of the deaths due to Covid-19 occur in the 65+ group [4], (iii) the effectiveness of the vaccination programme in Poland compared to EU countries is still quite poor [7]. On the other hand, Electronic Government Digitization Index of Poland characterizes steady progress over the past ten years, both in the value (0.85 in 2020) and in ranking position (24th in the 2020 ranking)[4]. Thus, the Polish experience allows us to adequately demonstrate the side effects of homogeneous government regulations on the vaccination that (i) arise despite the moderate initial prerequisites for the level of digitalization, and (ii) promise to be relevant for the government use in other EU countries.

Second, (i) although Facebook is the largest social networking site in terms of reach and popularity, Twitter dominates the sphere of public life around the world [39]; (ii) despite the fact that 58.7% of Polish Twitter audience composed of users aged between 18

and 44 years old[5], every year Polish seniors are more and more active in social media, and we meet them on Twitter now(14.3%) more often than on Facebook (10.6%) [40]; (iii) the potential of Twitter platform is noticed not only by ordinary users but also by state bodies, ministries, various offices, and political decision-makers as a news medium whose functions work very well as an intermediary for sharing 'hot' news, monitoring online public opinion, government-citizen interaction and influencing public policy-making [41]; (iv) as confirmed by numerous studies, social media data are useful to obtain valuable, real-time insights into attitudes toward Covid-19 vaccines to better understand public attitudes and sentiments about vaccines, discover policy weaknesses, and improve public value delivery [32]. According to [42] it is possible to get insights into NIPs from a quick international comparison of public comments on Twitter. Early information about vaccine hesitancy and anti-vaccination attitudes from Twitter data affect the decision-making process [43] and serve as an input to organize the preventive measures. Thus, Twitter comments data source, supplemented by national news and medical online portals, in comparison with pre-structured questionnaires, has significant advantages, expanding both the respondents audience sharing their experiences (seniors, their family members, healthcare workers, politicians, etc.), and the scope of unexpected research insights [44].

QDA Miner software is used for text data scraping. Our search for text data is limited to a query: "vaccination"[6] OR "vaccine" OR "covid-19" OR "coronavirus"[7] OR "Pfizer" OR "Moderna" OR "AstraZeneca" OR "Johnson&Johnson" AND "senior*". In total, we collected 50,726 tweets, which all texts are in Polish. The period for tweets scraping is 1st May till 31st May 2021. Next, the text preprocessing steps are performed. Python and R libraries are applied. We removed duplicate and empty tweets, and invalid data; performed text cleaning[8] and words lemmatization[9]. A set of 12,592 tweets is obtained. Next, we detect the language of the tweets[10] and retain tweets in Polish resulting in a dataset with 11,533 tweet documents. The same procedure is applied to the other two data sources. Finally, a set of (1) 624 comments from Polish news portals (period for comments scraping is 1st January till 31st May 2021, 444 comments after text preprocessing), and

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[1] i.e. gazeta.pl, biqdata. wyborcza.pl, next.gazeta.pl
[2] i.e. medonet.pl, mp.pl, abczdrowie.pl
[3] https://www.statista.com
[4] https://publicadministration.un.org
[5] https://www.statista.com
[6] "szczepimy" (Polish)

[7] "koronawirus" (Polish)
[8] tm package
[9] Morfologik Lexicon
[10] cldr language detection

(2) 373 articles from Polish medical portals (period for comments scraping is 1st January till 31st May 2021, 265 articles after text preprocessing) is established. Thus, three separate preprocessed datasets were included for further data analysis.

3.2. Data analysis

To derive the main research findings, the following qualitative and quantitative textual data analysis steps are realised.

First, to answer RQ1, the Latent Dirichlet allocation (LDA) topic modelling algorithm[11] is employed to extract the latent topics in the public comments/articles on the NIP toward seniors and their proportions. For the Twitter dataset, the 40-topic model is found to be optimal in terms of the average semantic coherence of the models. As a result of LDA models running, 40 topics, described by the top-weighted keywords and a set of documents, mostly associated with this topic are obtained. To interpret the results, the iterative process of topic labelling is performed: (1) experts independently performed the deep reading and coding labelled topics to create the first version of labels based on the keywords with the highest weight; (2) the experts discussed labels and refined topic labels by a deep reading of the most representative topic comments; (3) the experts jointly agreed on and described a final set of topic labels. As experts, three academics specialized in e-government and its transformation, and experienced in coding, interpreting and analysis of the unstructured (textual) data, are involved. The same topic modelling and labelling procedure are applied to the other two datasets. Ten topics for each dataset are extracted and labelled. Obtained 60 latent topics are analyzed by experts and partly merged with the aim, to eliminate duplicate labels/content, and finally, a list of 40 side effects of the NIP of seniors is formed. The proportions of the merged topics have been summed up (with preliminary numbers normalization). Then, the sentiment analysis of texts for each topic is performed. For this step, Polish Sentiment Lexicon[12] is used as a list of expressions annotated according to affect positive or negative categories [45]. As a result, a binary classification (positive/negative sentiment) for each of the 40 side effects is performed.

Second, to answer RQ2, we employ coding to identify relevant interactions between the topics and aggregate them into higher-order concepts (categories). For this purpose: (1) the experts independently analyzed the presence of the contextual

similarities between side effects labels to produce the first version of groups; (2) the experts discussed the categories and resolved discrepancies in the topic grouping; (3) the experts validated the groupings by triangulation with findings from extant studies on seniors e-government exclusion; (4) the experts agreed on final side effects' structure. As a result, eight categories of side effects are identified. Two of them are introduced in addition to the existing results of previous studies.

Third, to answer RQ3, the experts assigned side effects to e-governance functions to support the seniors' inclusion in the NIP. Four e-governance functions are formulated based on the legal normativity approach [46]. During the assigning process, we assume that one side effect could be addressed by several e-governance functions. The statistical analysis was conducted of the side effect structures to reveal the presence of patterns; for instance, the distribution of e-governance functions across the derived side effect categories.

4. Results and findings

This section presents the main results of this study. The results include the analysis of the side effects of the NIP for seniors (Section 4.1); the categories of side effects of NIP for seniors (Section 4.2); and e-governance function to support NIP for seniors (Section 4.3).

4.1. Side effects of national immunization program for seniors

This section provides an answer to the research question RQ1: What are the side effects of the national immunization program for seniors? The answer deepens our understanding of what side effects of NIP implementation are concerning public perception, expressed in social media. In total, 40 side effects are identified. The top five most important side effects account for 26.92% of the analyzed tweets (comments, articles) are presented in Table 1. The full list of identified side effects, their topic proportion (TP, %) and selected comment's examples is a part of the supplementary material[13]. Side effects associated with positive sentiment account for only 7.02% of the comments in our dataset (five topics) and mostly include informational posts (comments), containing announcements, data facts about conditions for the delivery, storage and distribution of vaccines; vaccine biological mechanisms and production process;

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incentive measures for people's engagement to the vaccination; and seniors digital skills training.

Table 1. Top-5 side effects of the NIP for seniors

Side Effect	TP, %
Limited or no access to Internet and/or Mobile phone	7.03
Poor organization of the vaccination in rural and remote areas	5.25
Poor quality of the official statistical data on governmental websites	5.03
Need for mobile (home) vaccination teams	4.88
Collective social responsibility	4.73

4.2. Categories of side effects of national immunization program for seniors

This section answers question RQ2: How are side effects of national immunization program for seniors grouped into the categories? We identify eight categories to represent the side effects: (1) Accessibility, (2) Awareness, (3) Engagement, (4) Data governance, (5) Distribution, (6) Trust, (7) Intermediaries support, and (8) Citizen rights. Each category covers specific, non-repetitive content. The first six categories are covered in research related to the issues of mitigating the effects of the seniors' digital exclusion regarding e-government [47]. However, the last two categories are a result of our study, expanding understanding of the most relevant factors of seniors' exclusion resulting from NIP and to provide a solid foundation for its improvement. Figure 1 demonstrates the degree of importance for the citizens of unresolved side effects of each category (based on topic proportions). The full list of the identified categories of the side effects is a part of the supplementary material[14].

Following characteristics of categories include description, content and proportion in the merged comments dataset:

1) The *Accessibility* category as a public policy objective is to provide ICT infrastructure, its availability and technology acceptance by the elders to use e-government services [14]. This category of the NIP side effects includes "Limited or no access to Internet and/or Mobile phone", "Poor quality of telemedicine and virtual care" and lack of "Seniors digital skills training". It represents 8.55% of all analyzed opinions.
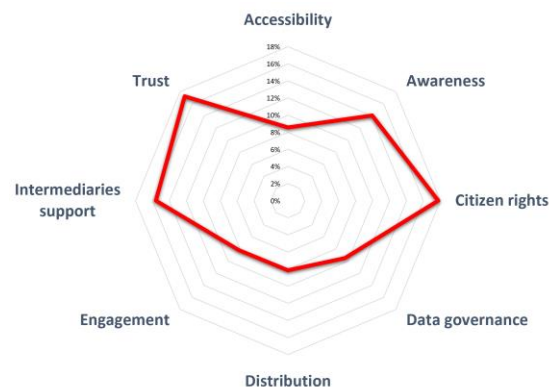

Figure 1. Coverage of the side effects by categories

2) The *Awareness* category as a public policy objective, is to provide continuous information flow to build awareness of NIP, its changes, and implementation, to both (i) a specific target group, characterized by an increased level of mistrust to changes, and new information sources [48], and (ii) a high degree of uncertainty and dynamic situation of Covid-19, that turned out to be limitedly effective and does not satisfy the needs of the population to be aware of: "Details of the NIP and vaccination points", "Local and systemic vaccine adverse reactions", "Vaccine biological mechanisms and production process", thus leading to "Low consciousness regarding the vaccination". This category represents 14.06% of all analyzed opinions.

3) The *Engagement* category as a public policy objective aims to involve seniors in civic activity to fulfil significant civilian roles for leisure or industrial activities [49]. Regarding NIP, seniors search for special "Incentives to the vaccination" and "Contextualized marketing campaigns" to overcome "Hesitation toward the vaccination". This category represents 8.20% of all analyzed opinions.

4) The *Data governance* category as a public policy objective is to define, apply and monitor the patterns of rules to control and ensure proper data quality and compliance with relevant legal and ethical requirements to guarantee that trustworthy decisions are made [50]. During the implementation of the NIP, unresolved data governance aspects are "Uncertainty and inconsistency of information due to dynamic data change", "Poor quality of the official statistical data on governmental websites", and "Need to monitor, collect and study data on vaccine side effects". This category represents 9.50% of all analyzed opinions.

5) The *Distribution* category involves fulfilling public policy objective to provide distribution channels of medical products and healthcare services,

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14 Side Effects Categories

which regarding seniors' perception of NIP expresses a need to resolve "Vaccine logistic issues", maintain required "Conditions for the delivery, storage and distribution of vaccines ", and avoid "Messy in the schedule" of the vaccination service delivery. This category represents 8.13% of all analyzed opinions.

6) The *Trust* category as a public policy objective is aimed at creating a comprehensive trust and confidence in the NIP and thereby increasing the degree of willingness to participate in this program [51]. The main obstacles to the formation of the necessary degree of trust and confidence in the seniors' NIP according to social network users are (i) "Resistance to the vaccination" due to (ii) "Fears of severe effects of the vaccination", "Vaccine quality" and "Increased deaths after the vaccination", (iii) "Limited relevant information on COVID mutations" and (iv) "Lack of tests before the vaccination", as well as information distortion due to the presence of (v) "Fake medical and political news" as well as cultural characteristics of the elderly, such as (vi) "Seniors religiosity". This category is the second in terms of the number of analyzed public opinions – 17.23%.

7) The *Intermediaries support* category as a public policy objective is to facilitate NIP implementation by bridging the gap between the government providers and seniors needs and requirements [52]. Considering the complexity of seniors' digital exclusion, and NIP implementation, the call for intermediary support to elders becomes especially acute, which explains the emergence of this additional category as a result of our study. Among the side effects of NIP, public discussion aroused around "Poor organization of the vaccination in rural and remote areas", "Difficulties to identify and localize seniors in urban area", "Limited support toward disabled elders", "Need for the mobile (home) vaccination teams", "Ineffective recall system and support", and "Direct or telephone contact". This category is the third in terms of the number of analyzed public opinions – 15.59%.

8) The *Citizen rights* category as a public policy objective consists of the government's obligation to ensure the observance of all citizens' rights by the State. In the context of the NIP implementation, introducing this category expands understanding importance of these aspects, unseen by the NIP as "Lack of insurance or the severe vaccine adverse reactions", "Suspended treatment of cancer patients", "Violation of freedom by compulsory vaccination", "Discrimination against people, who are not vaccinated", and "Forcing employees to get vaccinated", and the critical need to awaken and intensify "Collective social responsibility", and also "Lack of government openness and transparency". This category is the most crucial in terms of the number of analyzed public opinions – 17.74%.

4.3. E-governance functions to support the vaccination of seniors

This section answers the question RQ3: Which e-governance functions respond to the side effects of the national immunization program for seniors? Given the complex nature of e-government service provision toward elders, incorporating both governance and e-governance concepts, we look at the phenomena from a functional point of view.

The literature distinguishes various e-governance functions such as policy-making, regulation, and e-administrative service delivery [53]; or policy-making, regulation and operations [13]. We use legal normativity approach [46] in this study to define four e-governance functions (EGF). The first function – *protective* – is to protect the public value by the legal solutions, expressed by the protection of individual and public social interests, and assigning extra permission to the "weaker party", and their protection. The second function – *organizational* – is to organize a social life by the structure, governance, and management of various social life dimensions, and to assign legal responsibilities to public institutions. The third function – *informational* – is to shape positive attitudes toward legal regulations as a means of an expression of social policy objectives, or public value protection (p.e health, equality, freedom etc.). The *transactional* function is accomplished via the e-administrative process, as an effective instrument of public value provision.

We assigned 40 side effects to four e-governance functions. Each side effect could be addressed by several EGFs. As a result, the largest number of side effects is associated with the implementation of the Informational EGF (46.77%), in the second place is the Organizational EGF (24.19%), then the Protective and Transactional EGFs address each by 14.52%. The full results of the side effects assigning to EGF are a part of the supplementary material[15].

The EGFs regarding determined side effects are described as follows, covering the structure and the most significant content.

Informational function. This research identifies 29 side effects to be mitigated by informational EGF. This function is the primary one to solve most of the side effects, being present in the 7 out of 8 categories

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[15] Side effects assigned to E-government functions

(except for "Distribution"). In "Awareness", "Engagement", and "Trust" categories informational EGF addresses all of them. The most significant side effects assigned to this category are (1) "Poor organization of the vaccination for seniors of rural and remote areas" – low senior awareness on the conditions, possibilities, benefits of immunization, and lack of recall system; (2) "Poor quality of the official statistical data on governmental websites"; (3) "Collective social responsibility and assistance to the elderly" – social responsibility expressed by informing the institutions about seniors who live nearby and are willing to vaccinate at home; assisting seniors with relevant information on the vaccination process, direct help with registration and mobility.

Organizational function. This study identifies 15 side effects to mitigate by organizational EGF. This function responds to 6 out of 8 side effects categories. It fully covers the side effects in the "Distribution" and "Intermediaries support" categories. The most significant side effect is a need to respond to a limited number of the vaccination points, and long queues particularly in *"Rural and remote areas"*. Three urgent side effects are a necessity to organize the established system to "Mobile (home) vaccination teams" and "Direct (or telephone) contact with seniors for vaccination", and fixing "Messy scheduling" problems, thereby limiting administrative burden of healthcare (p.e. calling seniors, providing explanatory information, psychological assistance).

Transactional function. Nine side effects to mitigate by transactional EGF are identified. This EGF appears in 4 out of 8 categories. Primarily, enabling to solve "Limited or no Internet, and/or Mobile phone"

pointing to difficulties of using mobile phones, even at a basic level; the use of only stationary telephones; the absence of Internet and electronic services or lack of digital skills; problems with hearing, vision, limited movement and other forms of disabilities, which also limit the possibilities of using digital technologies.

Protective function. Protective EGF mitigates 9 side effects and responds to only in 2 out of 8 categories, fully covering "Citizen rights" and "Intermediaries support" side effects. Obtained results indicate the most important side effect is "Lack of insurance or the severe vaccine adverse reactions". Since some seniors cannot be vaccinated due to medical contraindications, their dissatisfaction concerns address "Discrimination against people, who are not vaccinated" and requires complex targeted protective and informational support.

Figure 2 depicts the distribution of the side effects categories across all EGFs. This distribution, (i) identifies the main components of the side effects for each EGF; (ii) provides information on the degree of importance to each EGF responding to the side effects; (iii) builds understanding on the degree of impact and complexity of each side effects' category in terms of need to involve various EGFs to resolve them. X-axis displays the proportion of the side effects of each category that are assigned to the E-governance function (%). Y-axis presents the importance of the E-governance function responding to side effects from each category (based on the number of side effects assigned to each EGF, weighted by the proportion of comments in which the side effect was discussed).
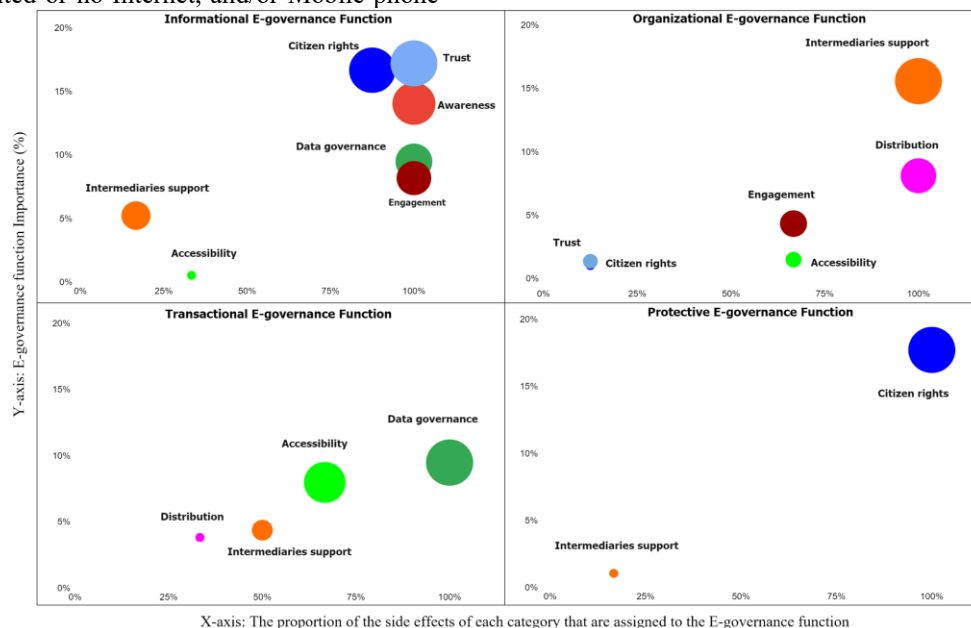

Figure 2. Distribution of the side effects categories by e-governance functions

5. Discussion and recommendations

In this paper, we addressed a knowledge gap of the side effects of e-governance of national immunization program for seniors. To fill this gap, we identify 40 side effects by analyzing text comments (articles, reviews) that express public perception regarding the results of the Polish NIP implementation to seniors' digital inclusion, categorizing and assigning them to four e-governance functions.

We understand e-governance functions as such, that result from the social contract between the citizen and the State, and are reflected in the normative acts. The legal normativity approach [46] relates to the functions of law, but we see the possibility of its application to the e-governance concept since its execution must follow the legal rigor.

The main methodological contribution of our work is to demonstrate how text analytics methods are successfully used to extract deep insights from online available public feedback to complement data obtained from carefully designed surveys [42]. We introduce a unique categorization of the side effects of NIP for seniors providing data on the degree of importance of the side effects in each category through citizens' experience. In line with [43] this can serve as the input to adapt inclusion and e-health policy into e-governance of the immunization of seniors.

Within a case study our results support findings of [54] as to the limited accessibility of elders to the Internet, lack of mobile phones [12]; lack of good quality statistical data on governmental websites [48], poor e-health telemedicine and virtual care quality [55]. The results confirm the importance of issues like accessibility, engagement, and data governance to elders' inclusion in line with [12].

Filling the gap in existing literature, our results shed light on the acute need to increase social responsibility to the seniors' inclusion in NIP. According to our results performing the informational function, public policy is to promote social responsibility to share the burden of individual civil rights limitations to support vulnerable and discriminated groups.

This paper identifies new categories of NIP's side effects not confirmed by the previous studies namely the need (1) of intermediaries' support for e-governance functions execution, and (2) protection of the fundamental civil and human rights. Our study indicates the crucial role of adopting a mixed human-IT approach toward e-service provision to avoid the digital divide in priori [52]. Moreover, this problem is of particular importance to the elders of urban areas, where social facilities face a higher number of elders [38]. Our study indicates real data-based, short-term

priorities of public policy such as respect for civil rights, enabling intermediary support, a necessity to build immunization awareness building and mitigating trust. Finally, our study presents a unique visualization of the distribution of the categories of the side effects of NIP implementation for seniors to e-governance functions.

The results point to guidelines and recommendations to policymakers and public health professionals regarding counteracting the side effects of national immunization programs for seniors. *First*, to undertake an extensive informational policy using adequate marketing streams to mitigate distrust and build seniors awareness. *Second*, to use e-government to strengthen networking, inter-departmental and adaptive governance of public intermediaries to support elders' immunization. *Third*, to provide data governance among governments, social and health care facilities and non-governmental organizations or individuals, engaged in elders support. *Fourth*, to provide good legislation guaranteeing civil liberties backed by a wide-ranging information campaign. Six, to shape, build, and strengthen the sense of social responsibility through extensive social campaigns.

6. Conclusions

This study aimed to scientifically recognize the issue of seniors' inclusion in NIP that heavily relies on e-government and services. This study adds to existing literature the analysis of the side effects of NIP for seniors according with four e-governance functions, namely protective, organizational, informational and transactional. Our research uncovered a rich catalogue of the side effects of NIP for seniors and provides the visualization of the importance of each e-governance function responding to the side effect categories. The results indicate a priority of civil rights protection, and institutional support of intermediaries to benefit e-health services. We formulate guidelines and recommendation for policymakers and e-health professionals.

One of the limitations of this study is a lack of comparative analysis of policy action undertaken by various EU State Members toward implementation of NIPs regarding the elders. Since the effectiveness of particular State Members varies, sharing good practices and experience is vital. Future research should concentrate on adopting an institutional approach toward the investigation of intermediaries in e-government services provision to the elders. The second direction of future research may focus on the adoption of the agency theory to understand and deeply revise the mechanism behind counteracting the digital divide to seniors.

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