

Attempt at profiling and regionalisation of COVID-19 vaccine campaigns in Poland – preliminary results

Andrzej Jarynowski¹  , Ireneusz Skawina² 

¹ Interdisciplinary Research Institute in Wrocław, Poland

² University of Social Sciences, Świdnica, Poland

Abstract

Background: Social attitudes and context have a fundamental impact on the COVID-19 vaccine acceptance. This issue will be challenging the existing Polish public health infrastructure during the planned immunisation program. **Material and methods:** We attempt to exemplify Poland-specific social background via causal diagram and regional factor analysis based on dimensions (epidemiological potential, ability to act, magical thinking, koronascepticism, information needs etc.) by December 2020 – shortly before vaccination started. **Results:** We identified several potential target subpopulations and provide possible regional classification. We distinguish clusters of regions where communication strategies should be taken into consideration: 1) extending campaign reach, common social goods and conformism; 2) individual's profits and misinformation blocking. **Conclusions:** We are signalling the need for profiling and regionalization in campaigns and propose possible starting points for protocols for various voivodeships when safe and effective vaccines are available in Poland.

Keywords: vaccine coverage · vaccine uptake · information campaigns · public health interventions · COVID-19

Citation

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Introduction

The National Anti-Covid Immunisation Programme announced on 08.12.2020 [1] involves a widespread, voluntary and free vaccination to take place in Poland in 2021. Discovery, delivery and logistics of candidates or soon available SARS-CoV-2 vaccines seem to be one

of the biggest challenges in the history of medicine [2]. However, due to shortened clinical trials or conspiracy theories [3-4], the issue of vaccine acceptance arose in particular societies. According to the opinion polls and surveys [5-9], less than 50% of the Polish adult population are willing to undergo any kind of anti-coronavirus vaccination and the majority still remains undecided. In

Corresponding author:

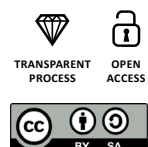
Andrzej Jarynowski, Interdisciplinary Research Institute in Wrocław, Poland
e-mail: ajarynowski@gmail.com

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Poland, confidence in vaccines for other diseases is a little below EU average, however Poles less confident over time [10]. The Polish government plans to carry out a large information and pro-turnout campaign [1], but empirical research on the relationship between vaccination uptake intent and acceptance in various Polish subpopulations is necessary [11-12]. The willingness [13-15] of a given person to be vaccinated is a combination of various factors: rational (*homo oeconomicus*), such as efficacy vs. safety calculation, psychological (*homo psychologicus*), such as trust or cognitive dissonance, as well as normative factors (*homo sociologicus*), like cultural or socialization issues. Achieving high acceptance of immunization in the population is required in order to achieve a high coverage level needed to reach herd immunity [11]. This will be a complex challenge [16-17] necessitating collaboration among various stakeholders, e.g. medical scientists, communication researchers and marketers, social and cognitive scientists, policy makers, public health officials, NGOs and patient group representatives and health care workers.

medical communication are extrapolating the results from foreign studies, mainly from English-speaking countries. However, it could lead to cognitive errors and misinterpretation, because the Polish sociocultural context has its own unique set of factors that significantly differ between geographical regions of Poland [18-19]. For instance, belief in conspiracy theories about COVID-19 significantly increases with eHealth literacy [20], just as vaccine safety negation increases with the education level [5, 21]. None of the conducted studies showed a univariate relationship between political views and various definitions of vaccination acceptance [5, 21-22]. On the other hand, opinions on mandatory prophylactic vaccination strongly depend on the education level, etc place of living, declared financial situation, religiosity etc [23]. In order to understand Poland-specific perspectives of COVID-19, both theoretical and pre-pandemic knowledge [11] should be accompanied with empirical research containing a rich variety of the concerns which can be captured via survey, observation, in-depth interviews or secondary data analysis [24-25]. It would then allow for identifying and profiling main target groups (Fig. 1), which in turn could increase the effectiveness of campaigns with main modifiable factors [3], such as vaccine information (information campaigns) and mitigate the harmful effects of misinformation and disinformation (information spread).

Some attempts to characterize each subpopulation have already been made (Fig. 1): for instance, it seems that young adult males are overrepresented within the “Ignorant” group, females among the “Anti-vacci-

Material and methods

Due to the lack of empirical evidence based on the Polish population [11], some analysts and experts in

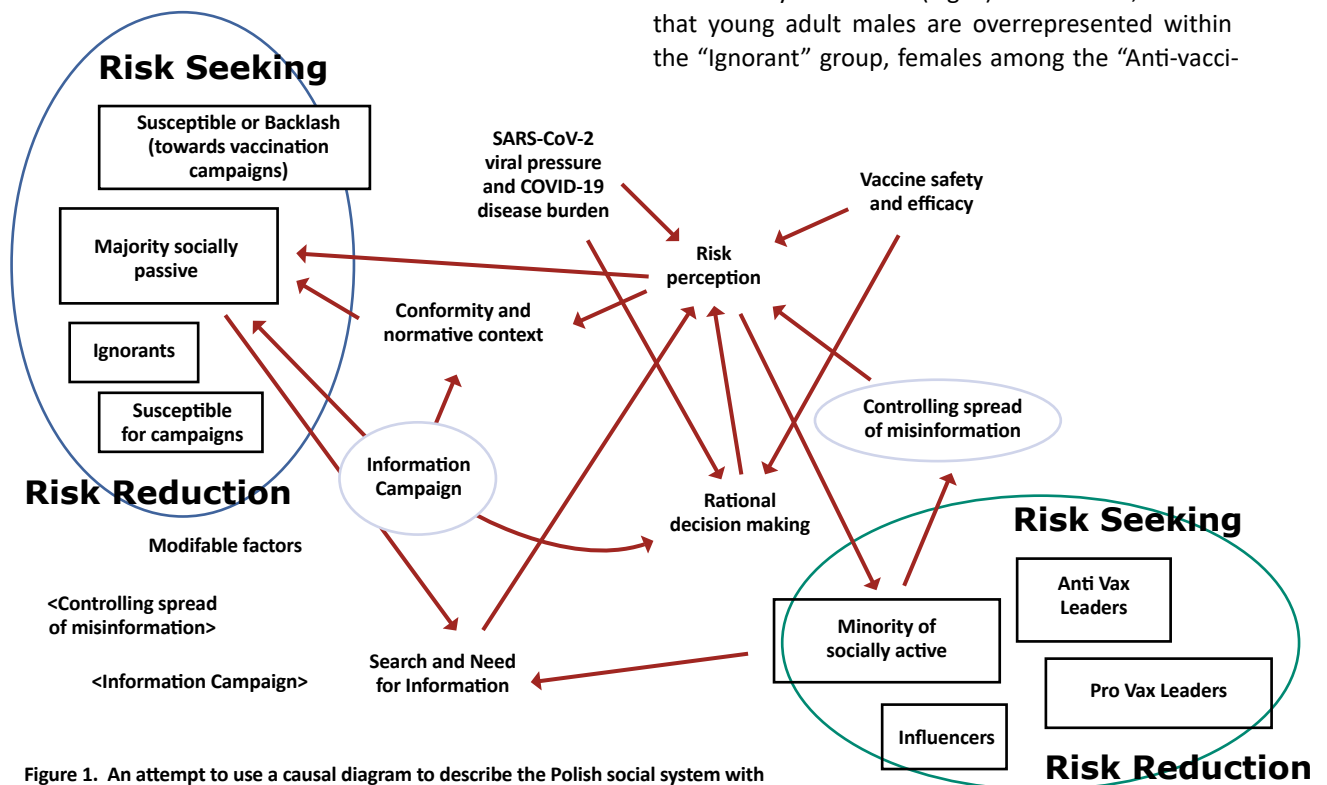


Figure 1. An attempt to use a causal diagram to describe the Polish social system with regard to vaccination amidst the pandemic. Rectangles are subpopulations (with its own composition of age, gender, place of residence, income, etc.), arrows indicate main interactions, shadow variables are modifiable factors (information campaigns and controlling the spread of (mis)-information)

nation Leaders” and the elderly among the “Susceptible to campaigns”, populists among “Susceptible to backlash” [5, 26-28]. However, some further profiling is needed. It is especially noticeable with regard to populations previously marginalized in pandemic social studies [24-25], i.e. the Polish elderly (disproportionately affected by the COVID-19), who need adequate support and information networks concerning the vaccination, as well as immigrants, who might be facing language barriers [29]. These groups are especially hardly able to properly estimate the risk-benefit ratio related to vaccination, so reaching them and providing information will be a key influencing factor. Moreover, some topics and concerns based on other vaccination programs [30-38] and COVID-19 vaccine [5, 39-41] have been preliminarily mapped.

Results

To understand the ground for COVID-19 vaccine acceptance in Poland, let us consider the data available at the voivodeship level (NUTS-2). In the various theories of social action usually the common assumption is that one should distinguish attitudes (as well as opinions) and socio-epidemiological background (context) from the sphere of activity (actions). A given population may not be fully confident about the COVID-19 vaccine, but it could be not enough for an active refusal - for this, a fertile social environment is needed. For instance, the inhabitants of big cities declare skipping mandatory vaccination a few times more than the rest of the popula-

tion [23]. A high fraction of people who were not convinced by immunisation and did not trust doctors, science or the government, were still agreeing to vaccination [21].

In order to operationalize the concepts of interest, let us try to define the following socio-epidemiological dimensions:

1. Koronascepticism – mean Google relative search volume (RSV) [42] 25.07-25.08.2020 (30 days) for phrases: “fałszywa pandemia” (false pandemic), “plandemia” (plandemic), “epidemia+ściema” (fake epidemic). The level of koronascepticism could be a proxy for susceptibility to backlash [43] (Fig. 1).
2. General_interest – interest of the general population in coronavirus by mean Google RSV [42] 25.07-25.08.2020 (30 days) for phrases: “koronawirus” (coronavirus), “zakażenia” (infections) and Coronavirus topic. To some extent, this measures information needs [11] with regard to the disease (Fig. 1).
3. Conspiracy_Theorists: Conspiracy Theories Potential is defined as an interest of the general population in various paranatural or conspiracy concepts by mean Google RSV [42] 08.12.2019-07.12.2020 (12 months) for phrases: QAnon, Kabala, UFO, as well as Horoscope and New World Order topics. Magical thinking [44] is known to anticorrelate with trust in vaccines [21] in Poland.
4. Cum_infections – Cumulative SARS-CoV-2 case notification number since the beginning of the epidemic until 8 XII 2020 per 5000 inhabitants [16].
5. Death_trend – Trend in the number of deaths de-

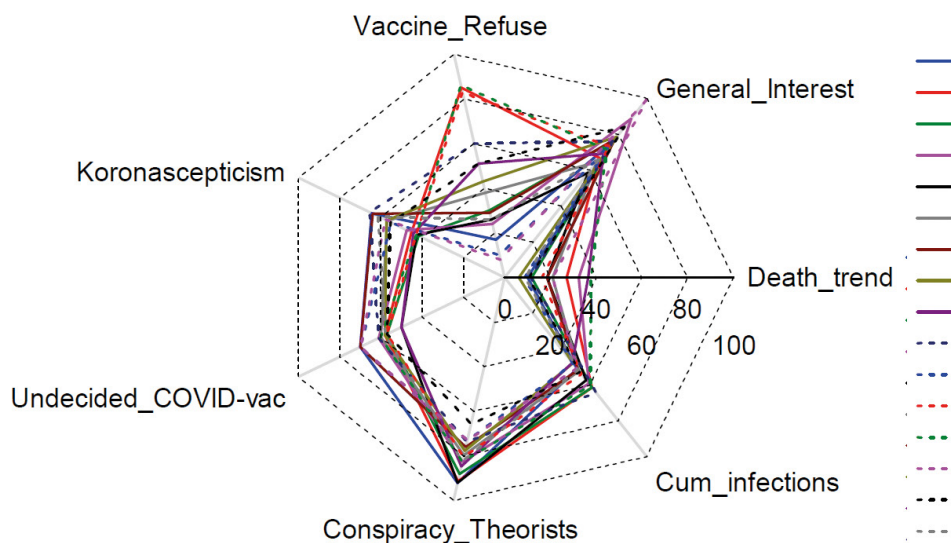


Figure 2. Radar graph of 7 chosen socio-epidemiological dimensions potentially related to willingness to COVID-19 vaccine uptake for the 16 Polish voivodeships

defined as the trend coefficient of daily death case registry due to COVID-19 1 XI – 8 XII 2020 [19]. Experienced total viral pressure (point 4) and recent disease burden (point 5) known as epidemiological potential in local neighborhoods may infer risk perception [45, 14].

6. Vaccine_refuse – vaccination refusal rate [46] for non-medical reasons (per 10000 planned vaccination aged 0-19 in 2018). This could be a proxy of potential ability to act.
7. Undecided_COVID-vac – percentage of respondents who in the Kantar survey [8] (mid October 2020) did not declare willingness to undergo vaccination against COVID-19 (on a macroregion NUTS-1 level only). It is a proxy of the size of subpopulation which could be susceptible to campaigns (Fig. 1).

Negative attitudes towards childhood immunisation according to surveys performed 2009 by voivodeship [47] anticorrelated with vaccine refusal rate, which suggest dissonance between attitude and action. It is worth noting that these dimensions may be defined in a different manner and many other dimensions could be added. Moreover, epidemiological potential and general interest (Fig. 1, 2) are highly temporal variables, so a longitudinal approach would be preferred as we have already seen that our observables are changing in time [48].

Discussion

We attempt to systematize geographical diversity by factor analysis. In this simplified approach we do not assume any weights and all 7 dimensions are considered as equal predictors of attitude towards COVID-19 vaccine.

Geographical differences (Tab. 1) could be utilized in a dedicated communication practice [45, 49]:

- Factor 1 – regions with a low potential for action but with a high rate of undecided people. Recommended communication strategy should consider improving the reach of campaigns with emotionally-oriented content referring to conformism and common good [50].
- Factor 2 – regions that can significantly engage in vaccination refusal (high potential for action and high interest in conspiracy theories). Recommended communication strategy should emphasize individual profits [51] such as access to specific services and goods. Moderation of discussion in local traditional and social media could be considered for instance in Poznań, the Tricity [52] or in the górnośląskie agglomeration [53].

- Factor 3 – structurally heterogeneous vulnerable regions. Probably a separate strategy should be prepared for the Warsaw metropolitan area and the rest of mazowieckie. As usual, the opolskie Voivodeships difficult to classify due to its uniqueness [54].

It is important to mention that the proposed classification has partially revealed the socio-epide-

Table 1. Factor loads estimated with minimum likelihood method (using Statistica 13)

voivodeship	Factors		
	1	2	3
wielkopolskie		0.68	
kujawsko-pomorskie	-0.94		
małopolskie	-0.84		
dolnośląskie	-0.95		
łódzkie			-0.40
lubelskie	-0.90		
lubuskie	-0.96		
mazowieckie			-0.28
opolskie			0.27
podlaskie	-0.86		
pomorskie		0.65	
śląskie		0.76	
podkarpackie	-0.78		
świętokrzyskie	-0.90		
warmińsko-mazurskie			0.34
zachodnio-pomorskie	-0.93		
% Variance expl	0.73	0.15	0.04

miological structure of the regions, but a proper mix of qualitative and quantitative studies [55] should be conducted for each administrative unit to extensively explore the composition of subpopulations (Fig. 1) and the socio-epidemiological context (Fig. 2).

The issue of how to convince people to actually take the inoculum is very difficult and it requires the transfer of knowledge about audience profiling and content targeting from marketing research to public health. We showed that the simple rational and trust/information [41] deficit models alone could not easily explain vaccine hesitancy in Poland. This is just a preliminary and signalling study based on limited empirical data [56] and e.g. keywords selection in defining socio-epidemiological dimensions should be justified as the next step as well as Polish speaking Internet users are only a subset of the entire population. Vaccine discourse in core regions (factor 2), which tends to dominate due to a stronger political and economic position with a well-informed population knowing their civil rights, could be different to peripheral regions (factor 1), where counter-Enlightenment cultural and political initiative are more common [27]. However, based on this exploratory research, we can claim that the main responsibility should fall on the regional media and local governments (which on average acquire much higher trust than their national counterparts [57-58]) to prepare their own effective dissemination strategy. Especially during the first wave of COVID-19, local media (at least in dolnośląskie) broadcasted more reliable and less polarized information on coronavirus-related issues [59], in comparison with the nationwide media. Moreover, during the pandemic, central governmental agencies and the main players from the opposition parties are known to distribute fake news and manipulate the public by using sociotechnics, which is probably due to short-term political profits [59-60]. Thus, significant funds and responsibilities should be assigned to 16 voivodeships (NUTS-2) or even better to 380 poviats (NUTS-4) to prepare regional communication strategies in collaboration with local traditional and social journalists. Due to possible inequalities in organizational capital among regions, support from central institutions, think tanks and research centers could be required. Example of misclassification of mazowieckie (Table 1) suggests that even voivodeship could be too heterogeneous and deeper geographical mapping would be preferred (however it could be too difficult for logistical reasons in some less organized counties).

Nevertheless, our approach is only a local adaptation of the main information management pillars concerning COVID-19 vaccine [61-62], such as:

- accurate and timely knowledge transition on actual vaccine effectiveness (on individual and herd level) and safety, which must reach citizens and be understood by them;
- infoveillance of traditional and social media to monitor behavioral attitudes in all parts of the given society (Fig. 2);
- building (e)Health literacy, tailoring advice and messages to address various audiences (Fig. 1);
- controlling and improving knowledge propagation (e.g. fact checking), strategic partnerships should be formed across all local and central stakeholders.

Conclusions

To conclude, only local authorities and researchers who have the knowledge of their society [63-64] and communities with special needs as elderly [65-67], could deliver information in appropriate form and content [68]. Safe and effective vaccines do not only help the inoculated people (efficacy confirmed in multiple RCT), but their primary role should be stopping the spread of SARS-CoV-2 (if proved in observational studies or clinical trials). The theoretical effect of vaccination seems to be super-linear [69], so higher vaccine coverage could mean ever more QALYs (quality-adjusted life years) saved due to infections in the local population, as long as the proper balance in delivery among essential workers and high-risk groups in the first phase is satisfied. Thus, regionalized marketing could synergize with national [1, 41, 70] and pan-European [71] evidence-based platforms on benefit-risk disseminations for vaccines and further candidates, while the first person was vaccinated against COVID-19 in Poland on 27 XII 2020.

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