

SOCIAL MEDIA INITIATIVE IN UKRAINE: ANALYSIS OF ONLINE CONVERSATIONS ON POLIO, VACCINATION, AND ROUTINE IMMUNIZATION

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EXECUTIVE SUMMARY

This study examined how different communities in Ukraine use social media to communicate and search for information by applying a unique qualitative approach based on manual search and monitoring of popular and thematic social media spaces on Facebook and Vkontakte networks. Analysis of active discussions and information shared within pages revealed the level of communities' engagement and intentions to initiate and respond to vaccination-related conversations. Moreover, the study examined trending topics on routine immunization during October-November 2016, drawing conclusions about possible implications of circulated online pro- and anti-vaccination content for parents' vaccination decision making. This monitoring timeframe coincided with the renewal of a mass child immunization campaign after a temporary shortage of vaccines that greatly influenced the dynamic of social media conversations.

The findings illustrate the essential difference between usage of Facebook and Vkontakte networks by different communities. Professional communities, such as doctors and teachers, gather on Facebook to communicate about profession-related issues, while on the Vkontakte network, the audience is divided by personal interests, which includes immunizing children. The majority of parents gather to discuss various topics about upbringing and child health in specifically organized groups on Vkontakte, often only for mothers, under the theme of child support allowance in Ukraine. While the most active discussions occurred in these groups on Vkontakte, with limited presence of professionals, this study illustrates the visible communication gap between professionals and the more general audience, who use different communication platforms, in this case, being active on different social media networks.

Monitoring of city groups demonstrates a similar tendency in audience preferences to communicate about personal experiences through the Vkontakte network. Groups unite residents of particular cities with variable numbers of followers but with the same level of active communication within spaces. This city group phenomenon demonstrates communities' interest in receiving very specific localized information related to their living environment.

According to data collected, engagement in vaccination-related conversations and initial positive or negative viewpoints vary in different communities. For example, topics of vaccination and child immunization are not among teachers' and educators' priorities, while the majority of pages for medical workers contain positive articles about vaccines and child immunization from social media channels of the Ministry of Health in Ukraine (MOH) or the United Nations Children's Fund (UNICEF) in Ukraine. City public pages and groups play the important role of informing parents about delivery of vaccines to local hospitals. At the same time, parents' groups on Vkontakte network represent unique examples of social media spaces that unite a significant audience of mothers willing to share their vaccination-related experiences and listen to advice from their counterparts. This knowledge is essential for identifying the target group and mechanisms of possible intervention.

The quality of information disseminated on social media networks is affected by the fact that official institutions, as well as international and national organizations, maintain their accounts on Facebook

but have turned away from using Vkontakte for political and ethical reasons. This absence of official sources to disseminate credible information about child immunization along with the inability to address parents' concerns on social media foster the cultivation of misinformation and common myths about vaccines. The number of social media spaces that promote anti-vaccination views are more influential and substantive on the Vkontakte network, especially those spaces registered in Russia but easily accessible to the Ukrainian audience. Communities with negative opinions appeared to be more vocal on social media. Also, vaccination is a topic that can generate a high level of emotional involvement. Therefore, parents tend to communicate in dramatic ways experiences such as minor side effects after vaccination, considering them to be abnormal and dangerous to children's health and rarely correlating them with conditions of vaccine-preventable diseases.

Given these findings, the communication strategy around polio, vaccination, and routine immunization on social media can be further enhanced with new experimental tactics. Based on analysis of communities' engagement, the results of this study suggest mechanisms to intervene into already organized communication platforms - for example, of parents and professionals who often communicate within closed groups. The other component of a communication strategy would be to encourage medical professionals to engage in social media discussions with the general audience outside of their personal accounts. Overall, the recorded low quality of information on the Vkontakte network can be increased by constant sharing of reliable materials and the foundation of a new information source on this network. There is an urgent need for that type of action to counter easily circulated misinformation and build a strong image of vaccination in order to increase and maintain child immunization rates in Ukraine.

INTRODUCTION

The September 2015 polio outbreak in Ukraine was a reminder of the importance of maintaining high immunization rates in order to prevent emergence of a new outbreak of vaccine-preventable disease. Despite the fact that vaccination has been widely recognized as a successful public health measure, a growing number of parents have doubted its safety and necessity.

With the rise of online social media in the past few years, there is a great interest in the influence of such networks on health behaviors - in particular, child immunization and vaccination. People in Ukraine, across all socio-economic sectors and in all geographical areas, are extensive users of social media. Prior to this research, attempts to understand the role of social media in child immunization and vaccination processes were based on quantitative approaches, such as collecting online messages that directly mentioned polio and vaccination or analyzing users' interactions in a particular social media space. This study used a unique experimental approach of social media mapping to discover platforms where communities of parents, health and education professionals, and other civil society actors gather naturally. It included collecting lists of, first, popular public pages and personal pages with a major number of followers and, second, thematic social media spaces that are organized in the form of a public page or, alternatively, an open or closed group. In total, 660 social media spaces were selected for further assessment of relevant routine immunization and vaccination content on two major social media networks in Ukraine: Facebook and Vkontakte. Content about polio, vaccination, and routine immunization on each social media space was searched manually and later reviewed and assessed as either supportive of or resistant to vaccination efforts.

As a result of this research, we can better understand the role social media plays in decision making on vaccination and implications of vaccine-related sentiments within those spaces. Furthermore, this

allows us to identify target areas and possible mechanisms for engaging within those spaces and processes to ensure the presence of correct information for parents about vaccination. The recommendations of this study can be applied to enhance the effectiveness of the communication strategy on social media in order to expand immunization coverage in Ukraine.

The paper includes: the analysis of communities' engagement on social media; description of posted vaccination-related content, with specifics about trending topics; a look at key contributors; conclusions about the influence of vaccine-related sentiment on parents' vaccination decision making; recommendations to enhance communication strategy on social media; and a discussion of research methodology in the appendices.

RESULTS

POPULAR SOCIAL MEDIA SPACES

Monitoring of popular social media spaces illustrates the general interests of Ukrainian people. These pages are major sources for information, and the content posted within them can reach a large audience. Results showed that of 300 public pages and personal accounts on Facebook and Vkontakte, 34 included information supportive of routine immunization, 14 had negative sentiment, and 252 were without posts relevant to this topic. From the table below, it can be seen that resources with vaccination-related information are limited on the Vkontakte network. Only a few popular social media spaces featured content about vaccines:

Type	Number of spaces monitored	Sentiment towards routine immunization/vaccination/polio issues		
		Positive	Negative	No relevant posts
Public pages on Facebook	100	21	7	72
Personal pages on Facebook	100	11	4	85
Public pages on Vkontakte	100	2	3	95

Among popular public pages are those related to media resources that often post information about immunization and provide general updates about the availability of vaccines in Ukraine or news about MOH efforts to maintain broad-scale vaccination rates. However, several media outlets constantly portray vaccines in a negative light, with dramatic stories about side effects or criticism of vaccine supplies. For example, social media channels of the program "TSN", aired daily on the national "1+1" TV channel, distributed in September 2015 the opinion blog "What is a sickness of children in Zakarpattia and why humanitarian aid for polio vaccination must be destroyed" (Vkontakte¹) and posted on March 13, 2016 the video "In Rivne region child lost ability to walk after receiving a polio vaccine" (Vkontakte²). The other sample is the news magazine "Correspondent". Through social media channels on both Facebook and Vkontakte, several stories were disseminated, such as "Deathful vaccine: in Bila Tserkva child died after being vaccinated in a kindergarten" (Facebook³, Vkontakte⁴) and the opinion blog "2015: One year without vaccines in Ukraine" (Vkontakte⁵, Facebook⁶), with criticism of vaccine procurement by international organizations.

Results of mapping popular personal pages on Facebook showed that personal accounts of politicians (34 out of 100) and members of the media community (39 out of 100) who cover political and socio-economic issues have garnered a significant audience due to political instability in Ukraine. Routine immunization issues appeared in the context of the overall movement for reforms

in Ukraine to eliminate corruption - in particular, in the health care system and medicine procurement. The importance of child immunization was mentioned alongside news about a handover of vaccine procurement to international organizations. Among the vocal supporters of vaccination is physician Olga Bogomolets⁷ (57,102 followers), who is a member of the center-right party “Petro Poroshenko Bloc “Solidarity” and Chairwoman of the Parliamentary Committee on Health in Ukraine.

Across social media, the accounts of Evgeniy Komarovskiy, a well-known pediatrician from Kharkiv city, represent unique social media spaces with supportive views toward child immunization and a high level of community engagement, with 796,340 page followers on the Facebook public page⁸, 96,462 followers on his personal Facebook page⁹, and 387,906 page followers on the Vkontakte public page¹⁰. These social media spaces contain strong recommendations to follow the vaccination schedule. To support the argument, posts compare child mortality rates in the past to positive effects of vaccination in combating dangerous diseases.

THEMATIC SOCIAL MEDIA SPACES

There is an essential difference between usage of Facebook and Vkontakte networks by the Ukrainian audience. Politicians, medical experts, non-governmental organization (NGO) representatives, members of the media community, and other professionals maintain their personal accounts on Facebook, with extremely limited use of Vkontakte due to ethical and security concerns. (The network headquarters is based in Russia and has a record number of copyright controversies.) Facebook serves as a platform for communities based on their professional interests. Medical workers and teachers, for example, prefer this network for communication. On the other hand, the Vkontakte network is used by a more general audience divided by personal interests. One of them is child health, and the majority of interactions about vaccines and child immunization occur between members of this network within thematic groups. This reveals a visible communication gap between professionals and the general audience, who use different social media networks. This gap contributes to variations in the types of questions being discussed and the quality of information circulated within each of the social media networks. Misinformation spreads fast between parents gathered in open or closed groups on the Vkontakte network, where there is limited expert input and where checks on accuracy may not exist.

Monitoring of thematic social media pages uncovers a variable level of engagement by different communities in immunization-related communication, and the table below summarizes this information about the prevalent sentiment within each particular community:

Type of community	Medium	Number of spaces monitored	Sentiment toward routine immunization/vaccination/polio issues			
			Positive	Negative	No relevant posts	Difficult to Identify
Educational community	Facebook	10	1	-	9	-
	Vkontakte	10	-	-	10	-
Medical community	Facebook	8	8	-	-	-
	Vkontakte	2	1	-	1	-
Health-related social media spaces	Facebook	26	19	1	6	-
	Vkontakte	24	9	-	11	4
Children-related social media spaces	Facebook	30	4	-	23	3
	Vkontakte	20	4	1	12	3
City groups and public pages	Facebook	92	20	2	61	9
	Vkontakte	81	16	3	28	34

Parents' community	Facebook	10	5	2	1	2
	Vkontakte	24	2	-	-	22
Vaccination/polio social media spaces	Facebook	10	4	6	-	-
	Vkontakte	13	1	11	-	1

Education community

On Facebook, teachers and educators in Ukraine become members of special communication platforms to interact about profession-related issues. Usually, they share materials for lesson preparation, extend invitations to conferences, and discuss reforms in the education system of Ukraine in such groups as "Osvita.ua"¹¹, "For Primary School Teachers"¹², "NGO "Teachers for Democracy"¹³, and "Union of Educators in Ukraine"¹⁴, showing low engagement level in vaccination-related conversations. Within all social media spaces monitored, only one "Pedagogic Council"¹⁵ group on Facebook included several articles published during the polio outbreak in Ukraine and afterwards describing the availability of vaccines in Ukraine. However, compared to content related to education, those messages received less active response from group members. For example, a post on the latter page about the launch of a new informational resource about infectious diseases and vaccination was shared only 11 times, compared to a profession-related article that was shared 687 times.

Medical community

On Facebook, health care workers and medical professionals gather in specifically organized closed or open groups such as "National Medical Council of Ukraine"¹⁶, "KyivDoctors"¹⁷, "MedInfo"¹⁸, "Ukrainian Medical Association (UMA)"¹⁹ or "Doctors of Ukraine - Unite!"²⁰, which serve as platforms for information exchange. Members show interest in sharing profession-related articles and invitations to public events and medical conferences, with less engagement in commenting on and debating the information. At the same time, the information posted in such groups may influence their awareness on certain issues - in particular, about child immunization and vaccination. Often, articles include links from the websites or social media channels of UNICEF Ukraine and the MOH.

By contrast, the Vkontakte network demonstrates a limited number of active social media spaces for the medical community. The only major group on Vkontakte is one that unites medical students called the "Ukrainian Medical Students' Association"²¹, with 12,654 page followers and supportive posts towards vaccination during the polio outbreak in Ukraine.

Health-related issue pages

Among social media spaces of polyclinics, private medical centers, pharmacies, health magazines, and international and non-governmental organizations, almost 60% of pages contain posts with positive sentiment towards routine immunization and vaccination. Through public pages on Facebook and Vkontakte, state polyclinics and private hospitals encourage parents to vaccinate their children with available vaccines; however, those posts do not spark active discussions. Among Facebook groups, there is the official page of the MOH in Ukraine²² with 26,389 page followers, which is considered a reliable source of information about immunization and vaccination because the information from this page is shared by public pages of city administrations, local polyclinics, other medical units, and online communities of health professionals.

Some of these groups illustrate an example of linkages between medical workers and the general public. Groups can be administrated by a particular health professional to promote her or his services, as can be seen in the cases of a pediatrician from Zaporizzia, Larysa Grebeniuk

(Vkontakte²³, 29,670 page followers), a pediatrician from Khmelnytskyi, Dmytro Boichuk (Vkontakte²⁴, 2,167 page followers), or an infectiologist from Kherson, Yevgeniy Shcherbyna, who is the administrator of the public page “Notes of the Infectiologist” (Vkontakte²⁵, 3,195 group members). In the latter, the doctor replies to comments from a concerned audience in the special thread “Patients Consulting”, with over 2,500 comments. In general, public opinion about the importance of child vaccination within such spaces with an involved medical expert’s opinion is positive.

Children-related issue pages

The majority of the monitored social media spaces contain information about children’s products, activities for children, and child-friendly services in an urban environment. The other popular type of children-related issue pages is public pages of international and national organizations maintaining their accounts in order to inform the community about the organization’s activities. For example, the organization “Partnership for Every Child” (Facebook²⁶, 2,721 page followers) asserts in its description that its mission is to “professionally help families, communities and state to provide better solutions for children”. Another organization, “Child Hope” (Facebook²⁷, 1,886 group members), gathers 136 families and children with disabilities in Donetsk. It frequently publishes updates on conducted events along with an appeal for donations.

While being active in audience engagement, only a few spaces contain relevant information about vaccines. Those with supportive information about polio and vaccination are official pages of UNICEF in Ukraine (73,271 page followers on Facebook²⁸ and 55,302 page followers on Vkontakte²⁹). Even though both pages post the same immunization-related content, the level of engagement on Vkontakte page is comparatively low. The mentions of the UNICEF brand on this network were detected only in the medical students’ community (“Ukrainian Medical Students’ Association”) and in the articles about vaccine delivery shared from local media.

Doubting or anti-vaccination content was detected in groups under the themes of “autism” and “religion” - for example, NGO “Association of Parents of Children with Autism” (Facebook³⁰, 1,607 group members) and the public page “Children in Happy Family/Christianity” (Vkontakte³¹, 25,684 page followers). In the latter group, a list of recommendations for maternity and childbirth included a paragraph with arguments against vaccination of a newborn child with BCG (Bacillus Calmette-Guérin) or hepatitis B vaccines. The instruction of how to write an official refusal of vaccination certificate was enclosed with the post³².

City groups and public pages

This category of social media spaces gathers residents of a particular city in Ukraine. While thematic social media spaces illustrate more active engagement of residents from major Ukrainian cities, monitoring of city groups allows us to observe opinions of citizens in smaller cities.

Content about local politics, city transport, rates of utility services, health care, and public events are preferably shared from local media resources or city administrations rather than from national media resources. This illustrates communities’ interest in receiving very specific, localized information related to their living environment. Also, vaccination and routine immunization content with positive sentiment usually informs citizens about delivery of vaccines to a particular city and local polyclinics.

Thirty-four out of 43 city groups and public pages with active discussions about child immunization were identified on Vkontakte. For example, a popular type of social media page, “Overheard in (City name)”, allows audiences to leave their questions, anonymously as an option, to be published by a

page administrator. There are specific groups for almost every Ukrainian city - both major, such as “Overheard in Poltava”³³ (60,079 page followers), “Overheard in Kharkiv”³⁴ (60,800 page followers), and “Overheard in Sumy”³⁵ (29,750 page followers), and minor (for towns with fewer residents), such as “Overheard in Kovel”³⁶ (8,765 page followers) and “Overheard in Dubno”³⁷ (5,909 page followers), but with the same level of active discussions among members.

Unlike in other communities, monitoring of cities’ social media spaces has shown engagement of male account holders in discussions about vaccination. In the above-mentioned group “Overheard in Poltava”, 22 out of total 138 comments were published by male account holders in response to a post³⁸ about a pediatrician who discouraged parents from vaccinating children with DTP (diphtheria, pertussis (whooping cough), and tetanus) vaccine in a local polyclinic.

Parents’ groups

This type of social media spaces unites a significant number of parents’ personal accounts, mostly mothers - over 2 million in 34 public pages and groups selected for this study. Out of all, 7 that included supportive information about vaccination are public pages of children-related websites such as “UAUA.INFO - portal for parents” (Facebook³⁹, 23,684 page followers), “Mama WOW” (Facebook⁴⁰, 4,767 page followers), and the social media spaces of the pediatrician Evgeniy Komarovskiy. Anti-vaccination content was found on 2 social media spaces on the Facebook network: “Autism - therapy, inclusiveness. Forum of parents and professionals”⁴¹ (19,560 group members) and on the major public page for parents “Club of Parents Mastery”⁴² (378,377 page followers). The article “Reasons to refuse vaccination”⁴³, posted on the latter, was shared about 1,500 times by its followers.

However, the majority of parents’ social media spaces contain active discussions between communities’ members, who share personal experiences and seek advice from their peers. Therefore, 24 groups were recorded without specifically determined sentiments toward routine immunization, vaccination, and polio: 2 on Facebook and 22 on Vkontakte.

It terms of engagement, the Vkontakte network illustrates a significantly higher level of parents’ interactions. Special groups created for mothers under the theme of child support allowance in Ukraine or a particular city serve as an online communication platform about a variety of topics: child nutrition and food products, upbringing, child-friendly public places, and health care, including child immunization and vaccination. For example, “Child-support Allowance/Ukraine”⁴⁴ gathers over 165,868 members and generates approximately 15-60 comments under each question from the audience. Often, social media spaces associated with a particular city have fewer group members (e.g., “Moms of Energodar”⁴⁵ with 7,636 group members or “Moms of Kramatorsk”⁴⁶ with 4,674 group members). However, mothers actively communicate on a daily basis with their peers about issues related to before-vaccination procedures or after-vaccination conditions. Similarly to city groups and public pages, they tend to receive localized information related to their specific living environment - for example, details about availability of vaccines in the local hospital or pharmacy or recommendations about a trusted pediatrician in the city.

Vaccination/polio groups

In all, 23 social media spaces focused on vaccination and polio issues unite a relatively small total number of users from Ukraine - around 10,574. Of the 23, only 5 social media spaces share pro-vaccine opinions, and all of these are supported by UNICEF Ukraine or Rotary in Ukraine:

Facebook

“Stop Polio Ukraine”⁴⁷ (2,037 page followers)

“NGO “Parents for Vaccination”⁴⁸ (1,878 page followers)

“Vaccination - Healthy Society”⁴⁹ (527 page followers)

“Parents for Vaccination”⁵⁰ (229 group members)

Vkontakte

“Everything About Inoculations, Vaccines and Infectious Diseases”⁵¹ (64 page followers)

Most of the groups present vaccination-skeptical discussions and provide space for individuals with strong beliefs about the harmful and damaging nature of vaccines to cluster together. Generally, the major groups are registered in Russia and, due to an absence of language barriers, Ukrainians can easily access information in those groups. For example, “1796 - Homeopathy and Vaccination”⁵² has 5,826 followers on Facebook, and “Truth About Vaccination”⁵³ has 66,863 group members on Vkontakte. Other major anti-vaccination spaces with unidentified locations collect anti-vaccination content about Ukraine: “For Replacement of Vaccination in Ukraine” (Facebook⁵⁴, 287 page followers) and “Vaccination - Panacea or Sacrifice” (Vkontakte⁵⁵, 843 page followers, connected to the Russian website <http://antivakcina.org>).

In Ukraine, strong anti-vaccination voices are shared through the NGO “League of Civil Rights Protection” and its two social media channels: on Facebook⁵⁶ with 527 group members and on Vkontakte⁵⁷ with 950 group members. Established in September 2015, the Facebook page features a description informing the reader that the NGO was founded in 2006 as an entity that is “independent from any political, financial or religious interest” and whose activists are “parents and doctors united by the common interest to consciously care about their health and health of their children”. This organization has an official website and guides parents to seek more information there: <http://www.privivok.net.ua/>

Similarly, all anti-vaccination spaces explored in this study aim to:

- Collect vaccination-related content with negative views to prove the harmful nature of vaccines and discredit vaccination efforts. This includes articles, stories, personal comments, and investigations to discredit health experts. For example, the article “Expertgate” (<https://petrimazepa.com/expertgate.html>) claims to establish the ties that Fedir Lapiy, the Kyiv pediatric immunologist, and other experts have with pharmaceutical companies.
- Provide parents who oppose vaccination with information about mechanisms to overcome official regulations for their children to be accepted either to kindergarten or school without an obligatory vaccination certificate (for example, a step-by-step guide on how to refuse vaccination through an official claim).

ROUTINE-IMMUNIZATION- AND VACCINATION-RELATED CONTENT

Parents’ groups on the Vkontakte network provide valuable insights into parents’ decision-making process on vaccination. Immunization-related content such as questions and comments alongside graphic images appear on a daily basis and represent unique reflections of parents’ personal experiences. Topics of discussions can vary depending on the current situation with vaccines and the amount of negative media coverage and concurrent circulation of information about possible side effects that the situation generates.

Immunization-related content on Facebook appears mostly in response to news posted by official accounts, national media resources, or public figures. Audiences show an interest in sharing information rather than describing personal experiences in detail and with emotional involvement. The majority of immunization-related conversations are stimulated by social network accounts that are directly associated with this topic - for example, the public pages of pediatrician Evgeniy Komarovskiy or the social media channels of UNICEF in Ukraine or the MOH. In addition, sensational stories (usually, with negative sentiments) are more likely to go viral on Facebook and get noticed by the audience. For example, when posted on a popular personal page or on the public page of a news website, stories about adverse events following immunization (AEFIs) or vaccine shortages garner a high response from the community, which demands the attention of official representatives.

The timeframe of this monitoring (October-November 2016) coincided with the renewal of a mass child immunization campaign. The emergence of a single tetanus case in Ukraine in August 2016 publicly uncovered a problematic situation with regard to the availability of vaccines and turned MOH attention to this issue. After a temporary shortage, having prioritized the issue, the MOH delivered vaccines to Ukrainian polyclinics, with the message to ensure high vaccination rates. These circumstances allowed us to trace the dynamic of social media conversations and to observe communities' engagement with this topic.

Time and parents' intentions to communication about vaccination

According to information analyzed, conversations on vaccination occur with common triggers within these timeframes:

Morning (9 am - 10 am)

- To consult before visiting a pediatrician
- To check if vaccination is allowed with certain health conditions (e.g., nose cold, high temperature)

*"On Monday, we will have second polio vaccine dose. But recently we've had a nasal cold. Pediatrician assured that this condition would not influence vaccination. I have doubts. Please, share your advice."*⁵⁸

- Moms of Ukraine (Vkontakte, 46,003 members)

Afternoon (1 pm - 3 pm)

- To ask opinions after a nurse/pediatrician telephoned to inform the parent about the availability of a certain vaccine and to invite them to bring their child for vaccination
- To share an experience after a morning visit to a pediatrician

*"Is it necessary to vaccinate against hepatitis? Today I received a call to bring child compulsorily. My child is 5 months old."*⁵⁹

- Child-support Allowance/Moms of Ukraine/Chatterbox (Vkontakte, 37,322 members)

Late evening (10 pm - 2 am)

- To share concerns about AEFIs a child may experience
- To explore general audience attitudes towards routine immunization or vaccination with particular type of vaccines
- To seek information about a certain type of vaccine and its availability in a local hospital

*"Often I read comments that after DTP vaccine children have high temperature and they can't stand on their legs! Why is it necessary getting such vaccines if they cause so serious side-effects?"*⁶⁰

- Child-support Allowance/Conversations of Moms of Ukraine (Vkontakte, 21,609 members)

The most active audiences engage in conversations on routine immunization and vaccination in the late evening. Often, the vaccination topic appears under the theme of a night chat to collect parents' general opinions. For example, the most commented-on immunization-related post throughout the

monitored period, with 259 comments, was published at 11 pm on October 22, 2016 in the major Vkontakte group “Child-support Allowance/Ukraine”: “Night chat for young mothers. Which vaccination should be done at the first place? And is it necessary overall?”⁶¹.

Compared to other topics on social media, vaccination-related content always prompts interactions and active discussions among parents defending their personal pro- or anti-vaccination views. This is influenced by high emotional involvement of mothers concerned about the well-being of their children together with the controversial public image of vaccines that has formed in recent years. When published in general chats, this topic may be intentionally used by the page administrator to boost engagement levels.

Trending topics about routine immunization and vaccination

Most of the social media conversations in the analyzed period reflected the process of vaccine delivery to local hospitals and renewal of the mass vaccination campaign. This suggests that availability of vaccines is one of the essential factors that activates social media conversations on routine immunization and needs to be addressed in a timely manner to avoid potential influence to vaccine uptake.

Public pages of media resources and city groups played a substantive role in informing parents about the availability of awaited vaccines. In addition, official accounts of governmental units and international organizations post updates on vaccine delivery to Ukrainian regions, encouraging parents to immunize children according to the national vaccination schedule.

Vaccination with delivered DTP vaccines has generated a significant volume of social media conversations. Through parents’ groups on the Vkontakte network, the audience commenced sharing concerns about vaccine reactions such as fever, pain at the injection site, redness, or inconsolable screaming or crying. Side effects and reactions became more noticeable for the public on social media networks. For example, during October-November 2016 in the “Child-support Allowance/Ukraine”⁶² group, 755 out of 1,087 immunization-related conversations discussed DTP vaccines. Statistics from the “Friendly Donbass Families”⁶³ group represent a similar dynamic: 119 out of 142 vaccination-related questions were posted about this type of vaccine.

Without access to accurate communication with professional explanation of common vaccine reactions, parents considered even temporary side effects to be abnormal and damaging to a child’s health. Numerous questions and comments published in a short period of time merged together into a strong flow, questioning DTP vaccines’ quality and safety and rapidly spreading across social networks. Comments and questions raised by parents often consisted of strong expressions such as “child became disabled”, “leg was paralyzed”, “lost ability to walk”, “hospitalized in difficult conditions”, or even “died because of the inoculation”. Parents were more likely to consider refusing DTP vaccines because they perceived side effects of vaccination as extremely dangerous to child health, rarely comparing these risks with the consequences of getting vaccine-preventable diseases or providing evidence that the vaccination was the actual cause of the symptom.

Overall, results show a similar pattern of conversation development in parents’ groups: from seeking information about the availability of vaccines in local clinics to sharing anxieties and concerns about reactions following vaccination. The example below presents information from the “Child-support Allowance/Moms UA”⁶⁴ group on the Vkontakte network with 21,165 group members:

Delivery of vaccines	October 10, 7:22pm <i>"Are DTP vaccines delivered to polyclinics?"</i> ⁶⁵
Concerns about AEFIs and side effects	October 13, 9:02pm <i>"DTP vaccines from India are now available in our polyclinic. As I've heard, children have a very strong vaccine reaction. Who has recently vaccinated a child and what was the reaction?"</i> ⁶⁶
	October 25, 9:01pm <i>"Who has recently vaccinated a child with DTP vaccine? What was the reaction? My 1.5 years old child is struggling from a strong pain in the legs and now is having difficulties with walking. I am extremely worried"</i> ⁶⁷
Increased level of mistrust in vaccine safety	November 24, 3:08pm <i>"Girls from Dnipro! Do you know where to buy DTP vaccine? I do not want to vaccinate with Indian"</i> ⁶⁸

The number of social media conversations about DTP vaccines decreased toward the end of the monitored period. This change occurred because of shifted interests of the audience, rather than restored confidence in vaccine safety. If a new DTP-vaccine-related post was published, the audience advised reviewing previous discussions within a group.

On Facebook, topics about DTP vaccines generated a higher volume of conversations only in vaccine-skeptical communities. For example, the organization "League of Civil Rights Protection"⁶⁹, which consistently discredits child immunization as an effective public health measure, collected news from local media sources about reaction to DTP vaccine, with headlines like: "The legs of 2-years old boy were paralyzed" (volynnews.com), "10 children were hospitalized after vaccination with DTP vaccine in Poltava region" (poltava.to), and "In Mykolaiv city child could not stand on his leg during 3 days after vaccination" (news.pn).

Monitoring showed that on Facebook, only sensational media stories or emotional posts received a high response from the audience. For example, a story about the hospitalization of a 17-year-old mother and her son in Bahmut (Donetsk oblast, government-controlled area) as a result of vaccination, posted by the personal account of a volunteer in the Eastern Ukraine named Raisa Shamko⁷⁰, was shared 251 times, with 49 comments predominantly with a negative sentiment. Also, the audience demanded a reaction from government representatives or journalists who manage their Facebook accounts by tagging them in the commenting thread.

Traditional media and social media networks

Frequently, conversations on social media networks reflect news from traditional media sources such as TV channels and newspapers. For example, on October 24, 2016, a news program on the major TV channel "STB" (<https://youtu.be/AUbyLX7Zjhc>) aired the story "Dirty vaccine", which investigated the "poor quality of DTP vaccines from India". Links to this TV story appeared immediately in several parents' communities and caused the level of parents' anxieties about vaccination to rise. For example, the audience in the "Moms of Kramatorsk"⁷¹ group mentioned this TV program in general chats published on October 24, November 2, and November 3, with over 200 comments under each. They also claimed to check the information about DTP vaccines delivered to their local hospitals. Building on the general mistrust in Ukrainian government efforts to reform the health care system, this program cultivated a persistent rumor: DTP vaccines produced in India were the cheapest that Ukraine could procure. It is important to note that, after this case, parents paid

attention to the country where BCG and polio vaccines were manufactured, too. If vaccines were produced in Canada, Belgium, or France, sentiment was more likely to remain neutral or positive about its quality.

At the same time, traditional media have an opportunity to present alternative points of view by, for example, asking health care professionals to comment. By contrast, social media networks, especially closed groups, provide an open environment for incorrect or false messages to circulate without barriers and can be taken by the public as trustworthy. This difference is noticeable especially in cases when, due to lack of knowledge or malicious intent, coincidental events are attributed to DTP vaccines. For example, the Vkontakte city group “Sumy - the best city in the world!”⁷² published pictures of “how DTP vaccine damaged child immune system”, which were widely shared by concerned parents. The potential for traditional media to encourage other perspectives can be seen when on November 15, 2016, these pictures were included in a news story on the “1+1” TV channel. Although the media repeated the mistake, it also prompted the doctor to step forward and explain, thus a pediatrician from the Sumy Children’s Hospital concluded that the pictures represented not “the reaction to vaccination, but an infection developed after an injury” (<https://www.youtube.com/watch?v=CYJIXEaCVJQ>).

Content analysis: Opinion polls

Another type of content that appears within social media is opinion polls. Created in a form of short questions with multiple answers (up to 10), they can be published on a particular social media space by a page administrator or a particular group member for other community members to vote. The summarized results are available to review for the rest of the community; however, if the poll is created anonymously, the list with respondents’ accounts is concealed.

During October-November 2016, 10 samples of opinion polls about vaccination were collected in parents’ and city groups on the Vkontakte network. They were intended to explore either general opinion about vaccination or opinion about vaccination specifically with DTP vaccine. Opinion polls that collect personal views about vaccination show a high percentages of parents who follow recommendations of the national immunization schedule. For example, the major opinion poll⁷³ with 3,047 votes on the “Doctor Komarovskiy. Official Page” (Table 1) on Vkontakte showed that 40.5% of respondents confirmed getting vaccination according to a national immunization schedule, with 16.8% of those claiming to refuse vaccines for their children. Similar figures are displayed in the opinion poll⁷⁴ with 256 votes in the “Child-support Allowance/Ukraine” group (Table 2) - with 50% in favor of vaccination and only about 13% against any vaccine uptake.

By contrast, results of opinion polls about DTP vaccines after a continuous flow of communication about parents’ fears and concerns regarding its safety illustrate a much higher percentage of DTP vaccine refusal. Twenty-seven out of 77 voters (35%) indicated they would refuse in the opinion poll⁷⁵, created by the personal account of a mother in the community “Child-support Allowance/Ukraine” (Table 3) on October 26, 2016. In addition, questions themselves mirror common messages circulated on social media networks. For example, with mistrust in the quality of Indian vaccines as “cheapest and low-quality”, 50% of parents selected “wait for European vaccines” (Table 4) in the opinion poll⁷⁶ posted in the “Moms of Dniprodzerzhynsk” group.

It is challenging to measure to what extent social media conversations influence parents’ opinion about vaccination. Analyzing data from these opinion polls allows us to track changes in the overall public opinion after continuous circulation of rumors and concerns without trustworthy explanation, and suggest that such sentiment can negatively affect the perception of vaccines safety.

Content analysis: Negative sentiment

Content with negative sentiment is usually created and circulated by vaccine-skeptical individuals and members of anti-vaccination groups to intentionally discourage parents from immunizing children. Posted on social media, many counterarguments include links from particular web-based resources. Under the theme of alternative medicine, these websites undermine credibility of vaccination efforts through information about the harmful impact of vaccines on child health:

MedAlternativa	http://medalternativa.info
Life Movement	http://life-move.ru/
Rusekar	http://ruslekar.info
Genocide of Rus People	http://genocid.net/
League of Civil Right Protection	http://www.privivok.net.ua
Vaccination - Panacea or Death	http://antivakcina.org

The anti-vaccination posts contain links to the movie “Vaxxed. From Cover-Up to Catastrophe” (2016), as well as articles with headlines such as “Vaccines – cancer in a syringe”, “Vaccine as a possible reason for an autism”, and “Herbicide Glyphosate was discovered in vaccines”.

A specific type of content is widely spread on the Vkontakte network in the form of announcements to collect monetary donations for children who supposedly contracted serious diseases (infantile cerebral paralysis, autism, etc.) after vaccination. Even though no direct connection with anti-vaccination groups was detected, the credibility of such announcements is highly questionable, and they may have an impact on existing myths about vaccines’ harmful effects on a child’s health.

While vaccination-skeptical information that appears on Vkontakte is perceived as reflective of an independent point of view, it is more likely to be regarded by the audience on Facebook with suspicion. When an article with definite anti-vaccination views is posted in general groups, members assume the possible involvement of anti-vaccination followers or refer to the content as “anti-vaccination propaganda”. As a sample, when the major parents’ group on Facebook “Club of Parental Mastery”⁷⁷ re-posted the article “Reasons to refuse vaccination”⁷⁸ with the vaccination-skeptical opinion of a Kazakhstan homeopathic doctor, 59 out of 63 comments claimed to unsubscribe from this resource, which shares controversial information.

Content analysis: Positive sentiment

According to general assessment during the first stage of the monitoring, the number of social media spaces with supportive views toward child immunization on Facebook far outweighs the number on the Vkontakte social media network. On the former, public pages of governmental units, polyclinics, and national and international organizations transfer qualitative information in the form of infographics, reminders to vaccinate children according to the national recommended childhood vaccination schedule, and articles by and comments of health professionals. For example, on October 24, 2016, the MOH-issued infographic “Everything you need to know about vaccination”⁷⁹, explaining actions to take before and after vaccination, was shared 831 times (specifically, by 7 regional polyclinics, 2 pharmacies, 5 city administrations, and 4 medical NGOs). This shows how a well-designed message communicated in a timely manner to meet a public demand for information can result in transferring reliable information to multiple groups within a social media network – in this case, Facebook.

On Vkontakte, the only sources with positive content related to child immunization are: the social media channel of UNICEF in Ukraine⁸⁰, with a relatively low engagement level; pages connected to

health professionals (e.g., “Doctor Komarovskiy. Official Page”⁸¹, “Notes of the Infectiologist”⁸², “My pediatrician Vasyliy Chaika”⁸³, “Pediatrician. Growing Up Healthy (mother-baby-doctor)”⁸⁴); articles from media resources - for example, about availability of vaccines in particular cities; and pro-vaccination personal accounts. Compared with Facebook, a minimal volume of positive vaccination messages is to be found, leaving vacuums to be filled by other agents.

The majority of positive messages toward child immunization on both monitored networks do not generate a high level of community engagement, especially if they exclude any questions, controversial issues, or visual materials. In the monitored timeframe, the topics of conversations with positive sentiments included vaccination with polio and BCG vaccines.

Key contributors and influencers

Pro-vaccination opinions on Facebook appear in the personal accounts of individuals affiliated with the MOH and national and international organizations such as UNICEF in Ukraine, WHO in Ukraine, Rotary in Ukraine, and the NGO “Parents for Vaccination”, who are active in sharing information. Also, the newly appointed Minister of Health Uliana Suprun has established effective communication via her public page⁸⁵ informing the community about efforts to guarantee the availability of vaccines in Ukraine.

In reference to the engagement of medical experts within social media conversations, it is important to note that Doctor Evgeniy Komarovskiy⁸⁶ has a strong opinion leadership position among parents, who listen to and follow his recommendations related to child health.

Given the fact that accounts of influential society actors are registered on Facebook, their episodic engagement may influence the overall dynamic of online conversations on vaccination and, in some cases, spread an unverified fact. In the monitored timeframe, this phenomenon can be illustrated by how the article “12 years-old boy died from the polio-like illness in Volyn region” was disseminated through “Censor.net.ua” news website. Shared by the personal account of Yuriy Butusov⁸⁷, editor at “Censor.net.ua”, the article received 2,200 likes, 820 shares, and 167 comments from the followers of his personal page. Even though information about the confirmed diagnosis, which had no connection to poliomyelitis, was published by the same news website and MOH, this message reached a comparatively smaller audience.

On Vkontakte, the appearance of pro-vaccine contributors represents sporadic and individual intention rather than an organized or externally motivated movement. For example, within several conversations, health professionals provided arguments in support of vaccination and discussed questions with an audience. However, as these conversations were not a part of a planned or organized approach to providing immunization information, the impact is hard to measure and likely short lived.

By contrast, vaccine-skeptical audiences cluster together on the Vkontakte network, communicating through anti-vaccination groups that equip them with information about the danger of vaccines. Some individuals become vocal supporters, advocating for refusal of any vaccine uptake within other social media spaces and conversation threads. If an individual supports her or his views by sharing an anti-vaccine article or video, it is very likely she or he is a member or at least aware of the anti-vaccination groups. For example, after analyzing general chats in the major parents’ group “Child-support Allowance/Ukraine”⁸⁸, it is clear that active contributors strongly opposing child immunization are affiliated with anti-vaccination social media groups, such as “Rights Protection of Unvaccinated Children in Ukraine”⁸⁹, “Truth about Vaccination”⁹⁰ and “Vaccination: Pros and Cons”⁹¹.

On Facebook, the community of individuals promoting vaccine-skeptical discourse is well organized, too. The accounts of child immunization critics on social media often display limited personal information; however, they actively engage in conversations on routine immunization. For example, members of the group “League of Civil Rights Protection”⁹² constantly engage in each communication thread focused on child immunization and vaccines, which garners a high level of public attention.

An influential opinion leader of the anti-vaccination movement on social media is the personal account of Sergiy Dibrov⁹³ from Odesa. Through his personal page, with approximately 4,965 followers, he continuously publishes content to undermine child immunization efforts and to discredit the process of vaccine procurement by governmental agencies and international organizations. In addition, he shows substantive interest in collecting facts about vaccination on social media, especially controversial stories about AEFIs and side effects. As a sample, one of his posts⁹⁴, published on November 14, 2016, included pages from a book, published in the 1970s, that is critical of DTP vaccines. Also, he stated that, “Europe renounced the use DTP vaccines from India and Ukraine bought it as the cheapest option”. After an analysis of replies, it can be seen that he is perceived as an opinion leader for the male audience.

KEY RECOMMENDATIONS

There are two critical points to consider when designing initiatives to increase constructive dialogue around immunization in Ukraine. The first is that knowledge gleaned from this study about the character of different communities’ engagement provides a starting point for identifying and understanding essential social network audiences and the messages and communication approaches best suited to those audiences. Doing so requires a decentralized approach allowing for interventions suited to the social media platforms where parents and professionals already gather. The second is that the communication gap between the network spaces occupied by professionals and those of more general audiences can be countered by building connections between them and across the two main social networks (Facebook and Vkontakte) and by increasing the volume of professional opinion shared in general audience groups. It will, of course, be important to measure the effectiveness of the tactics and approaches adopted by tracking community reaction, engagement, and the flow of positive and negative sentiments.

Results of this analysis suggest several mechanisms to increase active and accurate communication about vaccines and immunization across both Facebook and Vkontakte and the spaces and processes within each. The recommendations below can be considered experimental and utilize different tactics and approaches. They can be applied in addition and complementary to those already implemented by communication specialists. The suggested communication strategy for social media engagement includes several components:

1. Increase the presence of credible facts and information within social media networks, especially on the Vkontakte network, in the form of compelling visuals and infographics.

It is important to ensure transmission of such information from official sources to communication platforms of different communities. Such content can be shared directly to the timeline of a social media space or by contacting the page administrator if access is limited. Given the history of inaccurate information being widely shared on AEFIs and the risks of vaccination, one area of content to explore could be comparison of the safety and benefits of vaccination and the real consequences of contracting a vaccine-preventable disease.

2. Create/support a resource on the Vkontakte network with the word “vaccination (прививка)” in the headline.

The recorded lack of public spaces on the Vkontakte network with supportive views about vaccination may negatively affect public perception. Keyword searches with “vaccine” or “vaccination” words on this network display only communities strongly opposing vaccination. In order to counterbalance this, the new resource with this word in Russian and Ukrainian languages can be a proactive way to inform and gather the community of parents with positive views about vaccination, who may become advocates within other parents’ or city social media spaces. The resource may be connected to one of the websites managed by UNICEF in Ukraine (e.g., <http://zdoroviy.com.ua>) to ensure credibility of information. However, to increase level of engagement, this recourse can combine approaches for transferring reliable facts about vaccination with community engagement techniques that were recorded as successful within, for example, parents’ (mothers’) communities (e.g., anonymous questions, opinion polls, night chats, an online Q&A session with a health professional).

3. Intervene into social media spaces of professionals (health care workers, teachers, etc.) with credible information about polio, vaccination, and child immunization.

As closed communities created mostly for sharing profession-related articles and news in the field, such spaces are a convenient way to reach experts with reliable vaccination-related information to raise their awareness about this topic. The information can be transferred from the social media channels of UNICEF in Ukraine or MOH in Ukraine or created specifically for each community. It is preferable to share such information from a relevant personal account of a professional to gain the community’s confidence. Such a person could be identified among present members or selected among trusted professionals and invited to join the group. Also, such groups are an open source to indicate active accounts of health professionals whose expertise may be engaged within other conversations.

4. Create a coordinated communication platform for experts with active social media profiles.

The pool of health experts with active social media profiles can be gathered into a coordinated communication platform, maintained by a social media specialist. The samples of conversations related to child immunization and vaccination can be collected in this group, so the members will be aware about where conversations occur and may decide to join the discussion. While monitoring, a social media specialist can tag an expert of this platform in a comment section by typing the @ symbol followed by his/her name. In this case, they will receive the notification about being tagged in the discussion and may choose to participate and present their knowledge.

5. Reach parents’ groups and ensure expert engagement in discussions to address public questions and concerns.

As platforms that unite parents - in particular, mothers - parents’ groups on Vkontakte and conversations there illustrate current views about vaccines and overall child immunization campaigns. To help raise awareness, a comprehensive list of parents’ groups should be compiled and permanently monitored by a social media specialist. Direct intervention is advised when concrete information is sought, such as a list of recommended vaccinations at certain age. To address specific questions about medical conditions, trusted medical experts (e.g., members of the communication platform described in the paragraph 4) may be encouraged to join and comment on a discussion. In addition to reactive communication, there are proactive tactics that can be effective, such as sharing child-immunization-related articles or videos from trusted and well-known doctors.

6. Monitor the dynamics and influence of anti-vaccination advocates on social media.

The monitoring showed that such groups are minor and consist of members with very determined beliefs about vaccination. The chance of any influence inside such communities is minimal, and groups' administrators look after new members and topics they raise in the group. However, the anti-vaccination community uses strategies of constant monitoring of social media spaces, which allows them to engage in discussions outside of their social media spaces. Often, messages from members of the anti-vaccination community include links to videos, articles, and thematic graphics. It is important to oppose their arguments with a similar tactic of messages with added links to reliable vaccination-related sources that can be accessible by other users.

7. Meet audience demand for localized and practical information related to their living environment.

The findings of the study illustrate how people are divided by location or particular personal interest on social media. When engaging within a particular parents' or city group, information shared must be connected to the interest of the audience - for example, news about delivery of vaccines to a particular city. It can be transmitted from a city administration website or a local media website by social media specialist. As an example of expert engagement, they may be encouraged to join city groups and parents' groups connected to their location. In this case, their involvement may become more permanent in the familiar environment rather than sporadic.

8. Plan effective communication on social media in advance of mass delivery of certain vaccines.

Advanced communication can be a tactic to avoid the potential for a high volume of parents' concerns and fears to flow onto social media. Honest explanation in simple language of possible side effects and the frequency at which they occur can prepare parents to perceive such events with a higher level of awareness. This information may be disseminated by mechanisms described above.

9. Ensure that the government and immunization partners have an emergency response plan in place should a communication-related issue emerge, such as widespread reporting of AEFIs or questionable vaccine quality. There needs to be a strong social media component to that plan.

This monitoring showed that in case of a sensational media story or dramatic vaccination-related case, the audience demanded response from an official institution. It is important to provide timely response from a responsible government body or official or other unit to address public concerns in case of a communication crisis related to vaccines. This information may be disseminated on social media by mechanisms described above.

10. Continue comprehensive monitoring of social media networks and online conversations.

In order to be aware of vaccination-related opinion, it is essential to continue monitoring social media networks. The dynamic of online conversations should be tracked by measuring the volume of negative content and analyzing the most frequently asked questions and concerns. This approach will help identify the type and style of information needed to engage parents effectively through the online platforms they prefer. It can also provide information and direction to health professionals wanting to engage with parents on the platforms they prefer. In the case of high-profile vaccine situations in the future, this monitoring will be important to follow the development of the situation on social media, identify key contributors and influencers, and locate main sources of the information distributed on social media networks. In terms of an engagement strategy, monitoring of social media spaces where these recommendations will be applied can measure their effectiveness and thus contribute to building an efficient and sustainable social media communication strategy.

Appendix 1. Methodology

Data collection: Social media mapping

The data for this study were collected during October-November 2016 on the two main social media networks in Ukraine – Facebook (facebook.com) and Vkontakte (vk.com). This choice was made on the basis of their popularity among the Ukrainian population. Recent data indicate that there are 7 million accounts on the Facebook network¹ and 27 million accounts on the Vkontakte network².

To map the research field, information was collected about popular and thematic social media spaces. Popular social media spaces, organized in the form of a personal page or a public page, are those with the greatest number of followers in Ukraine. Another focus was to map social media spaces of 7 different themes: where members of the education community, medical community, and parents gather to communicate and search for information; those related to health, children, polio, and vaccination issues; and social media spaces in 2 different cities in each Ukrainian oblast, excluding cities of the temporarily occupied territory of Crimea. Thematic social media spaces are usually created as a public page or in the form of an open or, alternatively, a closed group, where members may post content without pre-moderation by a group administrator. However, while anyone can join an open group, new members of closed groups have to be approved by a group administrator. During this study, access was requested to closed groups and, if accepted, information was gathered for the study, but without intervention in the group dynamic.

Most of the data were collected manually by keyword search. Keywords were typed in Ukrainian and Russian languages, as both are widely used in Ukraine. A general requirement for inclusion of a social media space in the study was a location that is displayed in the section “Information” on each social media space. Only those registered in Ukraine were considered for advanced monitoring, with a few exceptions made for anti-vaccination groups registered in Russia but with a major number of followers from Ukraine.

Different approaches were applied in forming the lists of popular and thematic social media spaces. The list of popular public pages on Facebook was composed with the SocialBaker engine: <https://www.socialbakers.com/statistics/facebook/pages/>. This programme automatically generated a list of the most popular public pages in Ukraine. In addition, specific filters allowed for the updating and sequencing of pages according to the number of followers only from this country. There is no available automatic engine to identify popular personal pages on Facebook from a particular country, so the list of 100 popular personal pages from Ukraine was searched manually. The only summarized information available online was found in the article “TOP-50 Ukrainian bloggers on Facebook and Twitter”, which was issued on December 1, 2014³ by the magazine “New Time”. This article was used as a source for initial mapping, but each personal page was updated with a current number of followers. The rest of the list was completed by a manual search based on knowledge of the current situation in Ukraine and popular public figures in political,

¹ Watchers, *Ukrainian audience on Facebook network rises dramatically – by one third in 7 months*, November 25, 2016: <http://watcher.com.ua/2016/11/25/ukrayinska-audytoriya-facebook-demonstruye-fantastychni-tempy-rostu-zbilshylas-na-tretynu-osoho-za-7-misyatsiv/>

² Watchers, *Ukrainians on social media networks: new Yandex research*, August 21, 2014: <http://watcher.com.ua/2014/08/21/ukrayintsi-v-sotsialnyh-merezhah-nove-doslidzhennya-vid-yandeksa/>

³ New Time, *TOP-50 Ukrainian bloggers on Facebook and Twitter*, December 1, 2014: <http://nv.ua/publications/virtualnye-geroi-politiki-i-zhurnalisty-tesnyat-pop-znamenitostey-v-facebook-i-twitter-infografika-nv-22945.html>

social, and cultural spheres. It was possible to structure the list of 100 popular pages on the Vkontakte network using a built-in filter on this website. It automatically sorted social media pages registered in Ukraine in order of descending number of followers.

The social media spaces identified using the above-described process were then classified by their main focus. Among personal pages, some were related to politics, the media community, representatives of non-governmental organizations, and other civil society actors and were classified accordingly. Popular public pages on Facebook and Vkontakte networks were classified as media sources, communities of personal interests, and those related to actors, sports, places, music, entertainment, and brands.

Mapping of thematic social media spaces was done using a manual keyword search. The keywords inputted into a search engine were those associated with a concrete community. For example, when searching for social media pages of the medical community, the following keywords were used: *"doctor"*, *"medicine"*, *"medical"*, *"health"*, *"healthy"*, *"pediatrician"*, and *"nurse"*. To map the community of educators and teachers, the keywords *"teacher"*, *"school"*, *"primary school"*, *"education"*, *"university"*, and *"higher education"* were used. In addition to mapping parents' groups by typical names such as *"mother"*, *"father"*, *"grandmother"*, *"grandfather"*, and *"parenthood"*, unofficial monikers *"mum"* and *"mummies"* widely used by people in Ukraine were also searched. Health-related social media spaces included public pages of polyclinics, private medical centers, pharmacies, health magazines, and international and non-governmental organizations. To discover relevant children-related social media spaces, public pages and groups of NGOs and other organizations, brands of children's products, and magazines about child health and upbringing were reviewed. Social media spaces with a focus on vaccination and polio were discovered by such search terms as *"inoculation"*, *"vaccination"*, *"vaccine"*, *"polio"*, *"poliomyelitis"*, and *"unvaccinated"*. Before mapping the city pages and groups on social media, the names of 2 major Ukrainian cities in each oblast were selected. The city name was basically used as the main keyword to discover online spaces that gathered its residents.

Because the keyword search identified numerous and sometimes irrelevant pages on both social media networks, additional selection criteria were applied to refine the sample. One of the criteria was *"Level of engagement"*, which allowed the exclusion of pages without recently recorded activity. Only those indicated as *"highly active"*, *"active"*, and *"moderately active"* according to the number of comments and daily posts were further examined. To mark groups with one of these indicators, a timeline of each social media space was reviewed to analyze the dates of recent posts, frequency of new posts, and an engagement panel (feedback buttons) with summarized number of likes, shares, and comments. A social media space described as *"highly active"* or *"active"* contained new posted content on a daily basis with comments from group members. The *"moderately active"* level of engagement was applied to the groups when the content was posted with daily/weekly regularity but with few comments or shares. Groups containing only advertisement (spam) content were excluded.

All social media spaces that fit the above-described criteria were saved into a Google document with separate sheets for each group of social media spaces: *"TOP-100 Facebook pages"*, *"TOP-100 Facebook personal pages"*, *"TOP-100 Vkontakte pages"*, *"Education community"*, *"Medical community"*, *"Health-related social media spaces"*, *"Children-related social media spaces"*, *"City groups and public pages"*, *"Parents' community"*, and *"Vaccination/Polio social media spaces"*. While reviewing a particular social media space, specific information was extracted such as type (public page, personal page, open/closed group), number of page followers or group members,

and main theme. A description was included with additional details such as an affiliation with a specific web-based resource or an organization, date of registration, and accounts of page administrators. Such information was inputted into respective columns on the Google document. The two additional columns - "comments" and "links" - were filled with information during sentiment analysis.

This exploration resulted in 660 social media spaces overall: 100 popular public pages and 100 popular personal pages on the Facebook network, 100 popular public pages on the Vkontakte network, 20 social media spaces of the education community, 10 social media spaces of the medical community, 50 health-related social media spaces, 50 children-related social media spaces, 173 city groups and public pages, 34 parents' groups, and 23 social media spaces with significant focus on polio and vaccination.

During mapping of social media, the information that would describe the character of the communities' engagement was gathered, too. Such information included general themes that unite a particular community - topics and questions people tend to communicate about with their counterparts. The distribution of male and female accounts was also analyzed along with the preference to choose one social media network for communication over another by a particular community. It was completed by comparing the number of social media spaces with "highly active" level of engagement distributed between Facebook and Vkontakte networks.

Because of the qualitative approach, the study design was flexible, and several changes were applied during its development. It was expected that the number of social media spaces that belong to a particular community of people on Facebook and Vkontakte networks would be even, so a similar number of social media spaces could be compared between both networks. However, the process showed the different character of social media usage by different communities. For example, the medical community has a limited number of active groups on the Vkontakte network, so 8 of 10 social media spaces considered for advanced monitoring were discovered on the Facebook network and only 2 on the Vkontakte network.

The research methods of this study have certain limitations largely due to the manual search process used to identify social media spaces. While a variety of search terms were applied and tested during monitoring, there is a chance that some social media spaces were excluded in the final list. In addition, requests for access to several closed groups were refused, thus eliminating the opportunity to examine content amongst some groups.

Sentiment analysis

To identify initial sentiment towards polio, vaccination, and routine immunization of each social media space, all content was reviewed. The unit of analysis consisted of a single post on a timeline by a page administrator or a group member. Comments published under a post were not taken into consideration at this stage of the monitoring.

The initial sentiment of each social media space was determined during the data collection process. When a social media space was added to the Google document mentioned above, a keyword search was conducted inside the page to identify vaccination-related content. The list of keywords included "polio", "poliomyelitis", "vaccine", "vaccination", "inoculation", "DTP", "BCG", "whooping cough", and "tetanus". Searching content on public pages and groups on the Facebook network required the use of a variety of grammatical forms of each keyword - placing it in plural and singular forms, changing cases of nouns and masculine and feminine endings for verbs, etc. because Facebook shows search results that contain an exact grammatical form of a word typed

into a search engine. By contrast, the Vkontakte search engine displays all posts that include a primary form of a particular word. This meant that different search terms and approaches were required for the 2 networks.

If any post included one of the mentioned words, the post was read and the content evaluated to determine what messages it contained regarding polio, vaccination, and routine immunization. A description of the published post was recorded to justify the decision to classify a social media space into one of the following sentiment categories:

- Positive: if any post on a timeline is in favor of polio/routine immunization/vaccination
- Negative: if any post on a timeline is not in favor of polio/routine immunization/vaccination
- No relevant posts: if no posts on a timeline are related to polio/routine immunization/vaccination

The majority of thematic social media spaces are organized in the form of open or closed groups that allow the audience to post questions. Such questions, which represent the personal experience of the group's members, can be positive, negative, or basically a request for additional information regarding child immunization or vaccination. Subsequently, another polarity was applied exclusively to classify sentiment within thematic social media spaces:

- Difficult to identify: if content is related to polio/routine immunization/vaccines but presents a variety of views from the audience

After sentiment of all social media spaces was identified, information was summarized into a timetable that illustrated general opinion about polio, vaccination, and routine immunization issues in different communities.

While monitoring each particular page, notes were taken of the findings that might be of interest at the content analysis stage. This information, along with relevant URLs, was saved into the "comments" section of the Google document for later review during content analysis.

Content analysis

In addition to describing the character of communities' engagement (preferred social media network, level of activity, topics of discussions) on social media and the sentiment towards immunization, vaccines, and polio within those spaces, the dynamics of social media conversations were analyzed. This analysis included the volume of conversations on a certain topic, frequently asked questions, and time of day (or night) of the most engaging posts. The focus of this study was to look at the current trends on social media; therefore, only content published during October-November 2016 was considered at this stage of the study. Themes for the content analysis were not identified in advance but, rather, derived from the emerging data, resulting in such phrases as *"time and parents' intentions to communicate about vaccination"*, *"trending topics about routine immunization and vaccination"*, *"traditional media and social media networks"*, *"content analysis: opinions polls"*, *"content analysis: positive sentiment"*, *"content analysis: negative sentiment"*, and *"key contributors and influencers"*.

Due to the substantial number of conversations, not all of them could be reviewed during monitoring, which can be seen as a limitation of the study. Throughout the duration of this study, the dynamic of social media conversations was followed, and vaccination-related conversations that were illustrative or influential on social media were highlighted and reviewed.

Advanced analytics were produced for selected social media spaces and conversations. First of all, 7 of 23 social media spaces with a focus on polio and vaccination, as the most related to the topic of this research, were further reviewed to identify the page or group administrators, key contributors with the description of their profiles, and specific topics of conversations. Social media spaces with a major number of followers that included both pro- and anti-vaccination views were chosen. The other part of the content analysis was to examine samples of “conversations” picked from popular public pages, popular personal pages, health-related pages, city groups, polio and vaccination social media spaces, and parents’ groups, as the most diverse and representative community in the topic of this research paper. The “conversation” as a unit of the analysis was defined as a post with all comments published in reply to it. Overall, 37 conversations on Facebook and Vkontakte networks were chosen, either because of the high level of public attention according to the number of comments and shares or with reference to a variety of emerging topics such as availability of vaccines, types of vaccines, the role of medical professionals, frequently asked questions, and concerns about vaccination. The description of a selected conversation included a translation into English language, URL, date and time of the post, statistics on the number of engagements (comments, likes, and shares), an account of the initiator with available personal information, and accounts of the main contributors of positive and negative opinions within a discussion. To identify key contributors, the commenting thread was reviewed, and the number of comments from a particular personal account was manually counted. Moreover, if a personal account shared vaccine-skeptical views, directly discouraging other parents from vaccination, that account’s timeline was screened by vaccination-related keywords, and the list of her or his favorite pages and groups was checked. This method allowed for identification of members of the anti-vaccination community who became vocal advocates for vaccination refusal within other social media spaces. These findings were included in the paragraph *“key contributors and influencers”*.

In addition to the information gleaned through in-depth analysis of a particular space or a conversation, supplementary methods were used to elaborate on each paragraph. To identify the time of the most active engagement in vaccination-related communication, the timeline was reviewed, and time markers were collected of all posts published between October-November 2016 in 3 parents’ groups on the Vkontakte network: “Moms of Ukraine” (<https://vk.com/ua.moms>; 46,003 members), “Child-support Allowance/Moms of Ukraine/Chatterbox” (https://vk.com/wall-50844213_1550608; 37,322 members), and “Child-support Allowance/Conversations of Moms of Ukraine” (https://vk.com/wall-64518003_2108509; 21,609 members). To identify trending topics about vaccination and immunization, several social media spaces indicated as “highly active” were examined with the available on the Vkontakte network application “Posts” (https://vk.com/app3876642_28257071). This application accumulates all content published in a specified timeframe and sorts it by search term. Twelve parents’ groups were examined on this network, which showed the same sequence of popular communication topics on vaccination. For example, among the over 189,000 posts that appeared during October-November 2016 on the major mothers’ group on Vkontakte “Child-support Allowance/Ukraine” (https://vk.com/ndp_official; 165,868 members), 755 posts were about DTP vaccines, 305 were about BCG vaccines, and 27 were about polio vaccines.

Collecting samples of specific content with positive and negative sentiment progressed simultaneously with the study development. While reviewing conversations and comments, the most frequently shared content in the form of a graphic image, a video, or an article was identified, and a list of websites that were the main sources of transferring anti-vaccination information to social

media was developed. The results of opinion polls, another type of content available on social media designed as a question with multiple short answers, were also used in preparing final conclusions.

Appendix 2. Figures and tables

Table 1. Public poll in the “Doctor Komarovskiy. Official Page” group

Q: Are your children vaccinated strictly according to the immunization schedule?
(3,047 votes)

Yes, all vaccinations are made on time	40.5%
No, problem is in absence of vaccine	12.8%
Child is often sick; we can't follow an immunization schedule	16.2%
Decided to delay until child is one year old	13.7%
Refusal of vaccination	16.8%

Table 2. Public poll in the “Child-support Allowance/Ukraine” group

Q: Do you vaccinate your children? (256 votes)

Yes, according to the immunization schedule	50%
Yes, but not with all doses	30.08%
No, I don't think it is necessary	13.67%
Skip and show the results	6.25%

Table 3. Public poll in the “Child-support Allowance/Ukraine” group

Q: Was your child vaccinated with DTP vaccine? (77 votes)

Vaccinated. Without regrets	20.78%
Vaccinated. Regretted, because side effects occurred	1.3%
Will vaccinate when an invitation is received	22.08%
Did not vaccinate. Wrote a refusal	35.06%
Your variant	20.78%

Table 4. Public poll in the “Moms of Dniprodzerzhynsk” group

Q: There have already been a significant number of posts about DTP vaccines (India). However, let's have a small monitoring here. (276 votes)

We do not get vaccination	26.8%
Vaccinated; everything went well, without side effects	11,2%
Vaccinated, but the child experienced serious side effects. If I had known, I would not have vaccinated	4%
Did not vaccinate. Waiting for European vaccines	50%

Did not vaccinate, but soon we will get vaccination with the Indian 8%
vaccine

Appendix 3. URLs

- 1 https://vk.com/tsnua?w=wall-20035339_1877307
- 2 https://vk.com/wall-20035339_1892896
- 3 <https://www.facebook.com/korrespondent.net/posts/10153260510136305?match=0L%2FRgNC40LLQuNCy0LrQuA%3D%3D>
- 4 https://vk.com/korrespondent?w=wall-11546691_537188
- 5 https://vk.com/wall-11546691_702914?w=wall-11546691_702914
- 6 <https://www.facebook.com/korrespondent.net/posts/10153445577736305?match=0LLQsNC60YbQuNC9>
- 7 <https://www.facebook.com/olgabogomolets?fref=ts>
- 8 <https://www.facebook.com/komarovskiy.net>
- 9 <https://www.facebook.com/uakomar>
- 10 <https://vk.com/eokomarovskiy>
- 11 https://www.facebook.com/osvita.ua/?ref=br_rs
- 12 https://vk.com/po4atkova_shkola
- 13 https://www.facebook.com/tdpUA/?ref=br_rs
- 14 https://www.facebook.com/groups/1419914631619499/?ref=suggested_groups
- 15 https://www.facebook.com/pedrada.osvita/?hc_ref=PAGES_TIMELINE&fref=nf
- 16 https://www.facebook.com/groups/1519399991682539/?notif_t=group_r2j_approved¬if_id=1477220513830838
- 17 <https://www.facebook.com/groups/kyivdoctors>
- 18 <https://www.facebook.com/groups/MedInfoUA/>
- 19 https://www.facebook.com/groups/vultopen/?ref=suggested_groups
- 20 <https://www.facebook.com/groups/179805372061845/>
- 21 <https://vk.com/ukrmsa>
- 22 <https://www.facebook.com/moz.ukr/?fref=ts>
- 23 <https://vk.com/club58452137>
- 24 https://vk.com/child_health
- 25 <https://vk.com/public99023927>
- 26 https://www.facebook.com/partnership4everychildUA/?ref=br_rs
- 27 https://www.facebook.com/groups/666451806786570/?ref=br_rs
- 28 <https://www.facebook.com/UNICEF.Ukraine/?fref=ts>
- 29 <https://vk.com/unicefua>
- 30 <https://www.facebook.com/Асоціація-родителів-дітей-с-аутизмом-223332054403482/>
- 31 https://vk.com/duhovno_nravstvennoe_vospitanie
- 32 https://vk.com/duhovno_nravstvennoe_vospitanie?w=wall-86496299_8221
- 33 https://vk.com/pl_overhear
- 34 <https://vk.com/kharkov.overheard>
- 35 https://vk.com/podslushano_sumy
- 36 https://vk.com/ok_op
- 37 <https://vk.com/public71548239>
- 38 https://vk.com/pl_overhear?w=wall-56314128_1295428
- 39 <https://www.facebook.com/uaua.info/>
- 40 https://www.facebook.com/motherWOW/?hc_ref=PAGES_TIMELINE&fref=nf
- 41 <https://www.facebook.com/groups/autismparentsandpro/>
- 42 https://www.facebook.com/vospitaj/?ref=br_rs
- 43 <https://www.facebook.com/vospitaj/posts/1156570507734870?match=0L7RgtC60LDQt9Cw0YLRjNGB0Y8%3D>
- 44 https://vk.com/ndp_official
- 45 <https://vk.com/dar.mamy>
- 46 https://vk.com/mamochki_kramatorska
- 47 <https://www.facebook.com/StopPolioUkraine/?fref=ts>
- 48 <https://www.facebook.com/bzvorgua/?fref=nf>
- 49 https://www.facebook.com/VakcinaciaZdoroveSuspilstvo/?ref=br_rs
- 50 <https://www.facebook.com/groups/bzvorgua/>
- 51 <https://vk.com/club108613768>
- 52 https://www.facebook.com/groups/184909694911895/?ref=br_rs
- 53 <https://vk.com/antiprivivki>
- 54 <https://www.facebook.com/За-заміну-вакцинації-в-Україні-1649280955344208/?fref=ts>
- 55 https://vk.com/antivakcina_org
- 56 <https://www.facebook.com/groups/privivok.net.ua/>
- 57 <https://vk.com/privivoknetua>

58 https://vk.com/ua.moms?w=wall-42599621_115330
59 https://vk.com/tarahtelochki?w=wall-50844213_1634472
60 https://vk.com/wall-64518003_2108509
61 https://vk.com/ndp_official?w=wall-45541689_17948226
62 https://vk.com/ndp_official
63 https://vk.com/dsd_donbass
64 https://vk.com/vuplatu_dp
65 https://vk.com/wall-61334375_1427604
66 https://vk.com/wall-61334375_1434752
67 https://vk.com/wall-61334375_1460760
68 https://vk.com/wall-61334375_1531227
69 <https://www.facebook.com/groups/privivok.net.ua/>
70 https://www.facebook.com/permalink.php?story_fbid=1178696305512118&id=100001152796008&pnref=story
71 https://vk.com/mamochki_kramatorska
72 https://vk.com/ilikesumy?w=wall-14378770_881480
73 https://vk.com/topic-49119584_27736200
74 https://vk.com/ndp_official?w=wall-45541689_17972719
75 https://vk.com/ndp_official?w=wall-45541689_18263813
76 https://vk.com/mamo4ki_dndz?w=wall-99716894_818825
77 https://www.facebook.com/vospitaj/?ref=br_rs
78 <https://www.facebook.com/vospitaj/posts/1214313135293940?match=0L%2FRgNC40LLQuNCy0LrQsA%3D%3D>
79 <https://www.facebook.com/moz.ukr/posts/673372422825866>
80 <https://vk.com/unicefua>
81 <https://vk.com/eokomarovskiy>
82 <https://vk.com/public99023927>
83 <https://vk.com/mypediatrist>
84 <https://vk.com/club58452137>
85 <https://www.facebook.com/ulanasuprun/?fref=ts>
86 <https://www.facebook.com/uakomar>
87 <https://www.facebook.com/butusov.yuriy/posts/1409182172455408>
88 https://vk.com/ndp_official
89 <https://vk.com/club52923686>
90 <https://vk.com/antiprivivki>
91 <https://vk.com/privivkanet>
92 <https://www.facebook.com/groups/privivok.net.ua/>
93 <https://www.facebook.com/sergiy.dibrov?fref=ts>
94 <https://www.facebook.com/sergiy.dibrov/posts/10209849014394613>