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Promoting COVID-19 vaccination uptake among migrant communities on social media

Evidence from Germany

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Studies from several countries suggest that COVID-19 vaccination rates are lower among migrant communities compared to the general population. The vaccination gap may be related to socio-economic status, language barriers, lack of trust in institutions or limited legal access.

Traditional government campaigns in print, television and radio encouraging vaccine uptake risk excluding many migrant groups due to language barriers and differences in media use. More recently, social media campaigns have become a pivotal communication tool to disseminate crucial health information to the public and promote vaccine uptake, although the evidence on effective approaches, particularly among migrant groups, is limited.

This study examines the effectiveness of a low-cost, targeted social media campaign to encourage COVID-19 vaccine uptake among Arabic, Turkish and Russian speakers in Germany. The study involved a series of online experiments on the social media platform Facebook. The experiments (so-called A/B Tests) compared how these different target groups reacted to a series of advertisements encouraging COVID-19 vaccine uptake, including by language and advertisement content (i.e. “messenger” promoting the vaccine). The design of the experiments was informed by prior consultation with local stakeholders through qualitative interviews.

KEY FINDINGS

- The campaign reached over 1 million Facebook users within a 27-day period in November and December 2021. In total, 17,000 users followed the advertisement for booking a COVID-19 vaccine appointment, and at least 1,800 people (i.e., on average 67 per day) were estimated to have received a vaccine. Considering the cost of the ad campaign, the per capita cost of one vaccinated person was estimated to be 4 EUR.

- The results show the extent to which German language-only outreach regarding the COVID-19 vaccination could exclude a large percentage of migrants, who comprise approximately 10% of Germany's population. Translating advertisements to the native language of major migrant groups in Germany appeared to dramatically increase the likelihood of booking a COVID-19 vaccine appointment, especially for more recent migrants (Arabic speakers in this study). For example, translated advertisements led to 133% more clicks on vaccine appointment booking tools among Arabic speakers, 76% more among Russian speakers and 15% more among Turkish speakers compared to German-only ads. Such a 'translation effect' extrapolated to vaccination rates at the national level would be equivalent to increasing vaccination rates among migrants in Germany by 14 percentage points, on average. This improvement would likely narrow observed vaccination gaps between migrant groups and the general population.
- Results regarding the impact of different 'messengers' (doctor, family, government representative, religious leader) revealed that advertisement content showing an official government representative was more effective in increasing the likelihood of booking an COVID-19 vaccine appointment than other messengers, especially among Arabic speakers.

These findings emphasize the potential impact that targeted, translated government COVID-19 vaccination campaigns on social media can have for harder-to-reach populations such as migrants, particularly recent arrivals with limited country-of-destination language skills. The impact is likely to be even larger at early stages in an outbreak when vaccination rates are lower, disinformation less widespread and hesitancy among certain populations not yet solidified.

More research is needed to apply this scalable methodology to other contexts and test additional forms of outreach.

1

BACKGROUND

THE MIGRANT VACCINATION GAP

Many migrant groups in several high-income countries have a higher risk of COVID-19 infection (Hayward et al., 2021).¹ Lower vaccination rates among migrants may be one reason for high infections (in addition to other risk factors such as poor housing and employment conditions). Several studies from high-income countries including the US, the UK and Germany indicate that COVID-19 vaccination rates are lower among migrant communities compared to the general population (Bzga, 2021; Kamal, Hodson, & Pearce, 2021; Malik, McFadden, Elharake, & Omer, 2020; Mipatrini, Stefanelli, Severoni, & Rezza, 2017; Paul, Steptoe, & Fancourt, 2021; RKI, 2021, 2022; Robertson et al., 2021; Tankwanchi, Jaca, Larson, Wiysonge, & Vermund, 2020).

Recent studies recommend improved community outreach and engagement through a variety of platforms to lower barriers to vaccination and encourage uptake among migrant groups (Brønholt et al., 2021; Crawshaw et al., 2021). However, the evidence on the effectiveness of different approaches is scant, especially with regard to harder-to-reach migrant groups (Hayward et al., 2021; Kumar et al., 2021). While the Global Compact of Migration (GCM) calls for improved access to basic health services for migrants (Objective 15) and the 2030 Agenda for Sustainable Development aims to ensure healthy lives and promotes well-being for all (SDG 3), COVID-19 related data disaggregated by migratory status are still scarce, making it difficult to understand the specific vulnerabilities of migrants in health-care services and the inclusion of migrants in vaccination programming (IOM, 2018). In August 2021, the WHO reported that most countries in the world do not include migrants in their vaccine rollout plans (WHO, 2021).

In this study, we assess the potential of a social media campaign to encourage COVID-19 vaccine uptake (i.e. booking a vaccine appointment) among migrant groups in Germany. The experiments were designed to test social media campaign material addressing two dominant hypotheses from the literature and confirmed with local stakeholders through qualitative interviews: The two main obstacles for public health communications among migrant communities are language barriers and mistrust of institutions (see next section).

Social media campaigns are a relevant case study because of their ability to have broad population coverage and low-cost reach. Social media has become a pivotal communication tool for governments and organizations to disseminate crucial public health information to the public (Jamison et al., 2020; Kumar et al., 2021; Tsao et

¹ THE DEFINITION OF A 'MIGRANT' VARIES ACROSS COUNTRIES. IN SEVERAL EU COUNTRIES, INCLUDING GERMANY, A 'MIGRANT BACKGROUND' REFERS TO INDIVIDUALS WHO WERE BORN IN ANOTHER COUNTRY (FIRST GENERATION) OR WHO HAVE AT LEAST ONE PARENT WHO WAS BORN IN ANOTHER COUNTRY (SECOND GENERATION). MANY OTHER COUNTRIES ONLY CONSIDER FIRST-GENERATION MIGRANTS – THOSE WHO WERE BORN ABROAD AND MIGRATED – AS MIGRANTS. IN THIS STUDY, DUE TO EMPIRICAL LIMITATIONS, MIGRANTS ARE IDENTIFIED BY THE LANGUAGE THEY SPEAK. UNFORTUNATELY, THIS IS LIKELY TO CAPTURE FIRST-GENERATION MIGRANTS WITH LIMITED DESTINATION-COUNTRY LANGUAGE SKILLS AND MORE LIKELY TO EXCLUDE SECOND-GENERATION MIGRANTS AND THOSE WITH FLUENCY IN THE DESTINATION-COUNTRY LANGUAGE (SEE NEXT SECTION FOR MORE DETAIL).

al., 2021).² In many communities, social media has become the dominant way of consuming media and obtaining information on social issues. Migrants often do not consume mainstream media in the countries of destination due to language issues and may, therefore, rely more often on information spread on social media. Studies have shown that having a migrant background can be associated with being more receptive to misinformation (Leuker et al., 2021; RKI, 2022; van Liempt & Mieke, 2020) which is widely spread on social media (i.e. infodemic).

Germany was selected as a case study because of its diverse migrant population and recent history of receiving close to 2 million refugees. In addition, at the time of the study, vaccines were readily available for all members of society. Germany is one of the most popular destination countries for migrants in the world (OECD, 2020). There are currently approximately 8.7 million foreigners who migrated to Germany – approx. 10% of the population (Statistisches Bundesamt, 2020). In 2020, there were 4 million households in Germany where German is not the dominant language. Since 2013, Germany has received a high number of asylum seekers, mainly from Arabic-speaking countries. Currently, there are approximately 1.6 million (2% of Germany’s population) recent migrants from Arabic-speaking countries with limited German language skills (including 790,000 migrants from Syria, 255,000 from Iraq, and 75,495 from Pakistan) (BAMF, 2020a).

This study aims to identify low-cost and scalable ways to engage with migrant communities and to provide accessible, non-technical guidance for policymakers with a view to increase vaccination uptake.

REASONS FOR LOWER VACCINE UPTAKE AMONG MIGRANT GROUPS

The reasons for lower vaccination rates in migrant communities are subject to much debate and urgent calls have been launched to provide equitable access to vaccines (Armocida et al., 2021).

² According to a Washington Post, up August 2021, at least 35 government agencies, nonprofit entities, corporations and public figures have purchased advertisements with different pro-vaccination messages, each set to reach — and hopefully persuade — Americans based on characteristics such as political affiliation, cultural identity and hobbies, a Washington Post analysis of Facebook ad data has found. Facebook said in a statement that it has given more than \$30 million this year in free advertising to governments and other groups for covid-related campaigns, including promoting the vaccine. Available at www.washingtonpost.com/technology/2021/08/24/vaccine-ad-targeting-covid/.

Reasons for vaccine hesitancy are complex (Brewer, Chapman, Rothman, Leask, & Kempe, 2017). First, certain migrant groups may lack legal access to vaccinations through general difficulties in accessing health care services (Mipatrini et al., 2017). Second, access to vaccines may be exacerbated due to language barriers (RKI, 2022). Some migrant groups may lack information about how to get access. Third, some studies have also suggested that migrants are less likely to decide to get vaccinated even when a vaccine is readily accessible to them (i.e. vaccine hesitancy) (Aktürk, Linde, Hapfelmeier, Kunisch, & Schneider, 2021; Deal et al., 2021). Vaccine hesitancy refers to a delay in acceptance or refusal of vaccination despite availability of vaccination services (Razai, Chaudhry, Doerholt, Bauld, & Majeed, 2021). Vaccine hesitancy among migrants has been studied, for example, in the context of measles outbreaks in the U.S. (Crawshaw et al., 2021; Tankwanchi et al., 2020).

Language barriers may not only limit access but also shape the ways in which information about the vaccine, its potential benefits and risks, is consumed. Recent survey evidence from Germany suggests that first and second generation migrants are more likely to feel uncertain regarding facts about the COVID-19 vaccine and are more often misinformed (RKI, 2022).

Official information and public vaccination campaigns are often not available in other languages. Studies from Canada, Denmark and the US reported lags in translating official guidance into foreign languages and poor dissemination to, and hence access by, migrant communities; importantly, groups with lower country of residence language and literacy levels were also found to have lower COVID-19 testing rates (Crawshaw et al., 2021). This has also been confirmed for Germany – the focus in this study - through desk research conducted in preparation of the online campaign. In November 2021, many official websites on COVID-19 vaccine information and appointment booking tools were not available, or only partially available, in Arabic, Turkish, Farsi, Polish and other languages of major migrant groups in Germany.

Migrants who find it challenging to navigate official information from health-services may be more likely to rely on information from social networks or family members and friends, increasing the risk of misinformation about COVID-19 and the COVID-19 vaccine (Brønholt et al., 2021; Knights et al., 2021; WHO, 2020).

In addition to language barriers, the literature suggests that lower vaccination rates among migrant groups may be related to higher levels of mistrust in governmental and official authorities. Different reasons for higher levels of mistrust are provided in the literature. In many countries, migrants face a higher risk of social exclusion, marginalization, and discrimination than non-migrants (Tankwanchi, Bowman, Garrison, Larson, & Wiysonge, 2021; Waterman, 2021). In many high-income countries, migrants also earn on average lower incomes, face poorer working conditions, and have lower educational attainment (OECD, 2018). Migrants may mistrust government institutions as a result of the perception that they are being denied the support necessary to achieve greater social mobility. In addition, many migrants experience direct discrimination on the labour and housing market (e.g. Auspurg, Schneck, & Hinz, 2019; Thijssen, van Tubergen, Coenders, Hellpap, & Jak, 2021; Zschirnt & Ruedin, 2016). Based on negative

experiences, migrants may associate government institutions and their employees as representatives of the ‘majority’ population who have been the perpetrators of discrimination in their daily lives. Lastly, some evidence, including from Germany, suggests that public authorities disadvantage migrants by responding more negatively to formal requests compared to requests filed by non-migrants (e.g. Hemker & Rink, 2017). Negative experiences with authorities may lead to mistrust in government as a whole, including health agencies, and thus reduce the willingness to accept health procedures administered by government authorities such as vaccination campaigns.

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RESEARCH DESIGN & METHODS

2

The study was designed as an evaluation of an online communication campaign intervention using a series of A/B tests on Facebook.

Facebook is currently the largest social network globally with 2.8 billion active monthly users. In Germany, Facebook reports that 40 - 47 million people can be reached using Facebook's advertisement platform in Germany, accounting for up to approximately 56.5% of the population.³ Facebook estimates that, in Germany, there are approximately 5 million users who do not speak German (10.6% of all Facebook users, which is comparable to the share of first-generation migrants in the German population). While undocumented migrants are a hard-to-reach population for offline surveys, social media and online surveys may be a tool to bridge that gap, since it has been shown that undocumented migrants use social media and the internet on a regular basis and that Facebook is among the most common applications used (Jauhiainen & Tedeschi, 2021).

In order to design the Facebook posts encouraging COVID-19 vaccine uptake, we first conducted a rapid desk review of online information available to migrant groups in Berlin, Germany. We found that many websites and vaccine booking tools (such as doctolib.de – the main tool used in Berlin) were only available in German. At times, information was translated partially into other languages (mostly Turkish, Arabic, Romanian; Bulgarian) and made available in PDF documents on hard-to-find locations on websites. Second, we conducted a series of interviews with local stakeholders in Berlin who engage with migrant communities including a local health agency, social work providers and an agency for intercultural communication. Experiences with social media outreach were limited, and activities were scattered, ad-hoc and largely not evaluated – partially due to funding and human resource constraints. These discussions underscored the potential utility of exploring the use of social media outreach to migrant groups and reaffirmed the need to focus the study on language and trust barriers. These results were then used to directly design the outreach materials (see Figure A1-A2).

Due to empirical limitations, the study identified 'migrants' by the language they use on Facebook. Languages of users on Facebook are either identified by the language in which users choose to use the Facebook interface in their settings or by their Facebook profile information, meaning they have identified themselves as speaking a certain language. In this study, we compare the effects of advertisements in four language groups (Arabic, Turkish, Russian, German) and with varying content (i.e. "messenger" promoting the vaccine). Identifying migrants by their language use allowed us to test the impact of translated outreach compared to German-only outreach. However, this approach is subject to limitations. First, we do not have verified information on the birthplace or nationality of Facebook users to infer a migrant status. Consequently, we are not able to assess outreach to foreign-born migrants who speak German but still face other barriers in accessing the COVID-19 vaccine. Second, it is possible that some

³ Estimated Facebook audience size in Germany according to Facebook's ad platform (as of 24 January 2022). Available at: <https://business.facebook.com/adsmanager/>

users use non-German languages on Facebook despite fluency in German. The degree of German-language skills may vary across migrant groups and according to the time of arrival in Germany. Arabic speakers largely reflect recent migrants in Germany with higher language barriers, including many refugees. Turkish speakers may include many long-settled and second-generation migrants in Germany with higher rates of fluency in German. Russian speakers include both recent and more settled migrants.

The different language groups (Arabic, Turkish, Russian) were selected partially based on the availability of official public information and vaccine appointment booking tools in these selected languages (in November 2021). For example, Polish migrants represent a large migrant group in Germany, yet there were no vaccine appointment booking tools available in Polish that we could advertise in our online experiments.

In each selected language, the advertisement content was a short text encouraging users to book their COVID-19 vaccination appointment, a still image of a ‘messenger’ (doctor, family, government representative, religious leader) and a slogan overlaid on the image (“Protect your family and friends – book your vaccination appointment now”, see Figure I and in the Annex Figure A1 – A2). Images for the doctor, the religious leader and the family were adjusted for each language group (i.e. featuring an Orthodox-Christian priest for Russian speakers and an imam for Arabic and Turkish speakers, see Annex for illustration). The ‘German’ politician/ government representative was the same across all language groups.

Users could then click on an integrated link at the bottom of the advertisement leading them to a website with information (in their preferred language) on how to directly book a vaccine appointment online, via telephone or walk-in opportunities in their area.⁴

⁴ Estimated Facebook audience size in Germany according to Facebook’s ad platform (as of 24 January 2022). Available at: <https://business.facebook.com/adsmanager/>.

Figure 1: Example of an Facebook advertisement used in the online experiment (in German)



Source: Vivarum Facebook Ad Manager, 2022

Note: English Translation of the German Ad: Top: "Are you vaccinated yet? Now you can easily book a vaccination appointment close to you". In image: "Protect your family and friends. Book a vaccination appointment now". Bottom: "Get the vaccination appointment here."

The series of Facebook posts were created and then advertised to the specific groups in November and December 2021. The performance of each advertisement was compared using A/B tests. An A/B test is an online experimental method to compare the user engagement and popularity of different posts. Posts can be targeted to specific user groups using the Facebook Ad manager. The appeal of A/B tests is that users are randomly assigned to either being exposed to one advertisement or another. This setup is a random experiment – the gold standard to identify causal relationships. The frequency at which posts are seen (i.e. "reach") and integrated links are clicked upon (i.e. "engagement" or "click rate") is then measured in the different groups and compared accordingly.

Three main outcomes were analyzed:

First, we assessed who and how many people could be reached by the campaign. Reach is defined by the number of Facebook users who have seen the advertisement on their feed.

Second, we assessed the number of likely vaccine appointment bookings. The targeted advertisements encouraged users to “take just a minute” to book their vaccine appointment. Advertisements were first disseminated in Berlin and subsequently in all of Germany. Confirming those who eventually were administered the vaccine as a result of the campaign was not possible given the various ways in which individuals may obtain the vaccine. Instead, the study used a proxy to assess the number of times users visited the vaccine appointment tools, and applying a conservative assumption that 20% of these may have eventually gotten vaccinated.

For the Berlin sample, we were able to collect data tracking who eventually visited the website which provided the tool for booking the vaccine either via phone, online or through walk-ins. We created this website and compiled information on how to quickly and easily access vaccines in Berlin (see Figure B1). Using the customized website was not possible for disseminating the advertisements in all of Germany because vaccine information, booking tools and general access varies largely across regions. For the Germany sample, we linked to an official website by the federal government (www.zusammengegendcorona.de, see Figure B2), providing links to appointment booking tools for every region in addition to a federal telephone hotline. Information and the hotline were available in Arabic, Turkish, and Russian (among other languages). Unlike our setup in Berlin, it was not possible to track who visited the government website for the Germany sample. As a result, we applied the “conversion rate” in Berlin (number of visitors on the appointment booking website divided by link clicks on the advertisement, i.e., 54%) to the Germany samples when calculating how many users likely received a vaccine. Third, we assessed cost-effectiveness of the campaign by calculating the cost per one assumed COVID-19 vaccine appointment. Costs included in the calculation were those for developing and running the advertisements on Facebook.

Fourth, we explored the effects of language and trust in the messenger by comparing the level of engagement with different advertisement designs (A/B tests). Engagement in this case is

defined as the click rate, i.e., the number of users who click on the button (“book appointment now”) in the advertisement among every 1000 users who have been exposed to the campaign on their feed. The statistical significance of differences in engagement among groups was also tested using the Pearson’s chi-squared test of differences in proportions.

The overall design of the study is illustrated in Table 1. The study was first piloted in Berlin (November 2021) and later scaled up to all of Germany (December 2021). The individual advertisements are included in the annex, see Figure A1.

Table 1: Study design

Location	Berlin	Germany			
Target user language	Arabic	Arabic	Turkish	Russian	German
Experiment 1 Language	The same ad was either presented in German or in the relevant origin language for each group (Arabic, Turkish, Russian).				
Experiment 1 Messenger	The same ad was disseminated using different images of the main messengers including 1) a doctor 2) a politician/ government representative 3) a family and 4) a religious leader.				

3



RESULTS

DURATION AND OVERALL REACH OF THE CAMPAIGN

The campaigns in Berlin and all of Germany ran in total over 27 days and cost approximately 7275 EUR. In total, it consisted of 43 separate advertisements that were tested against each other as described in Table 1. In total, all advertisements combined were seen by 1,020,000 Facebook users (i.e. “reach”), approximately 37,700 a day. On average, the campaign reached predominantly users between 25 and 55 years old (68% of users fell in this age group). The campaign reached more male users (60%) compared to female users (40%) (see Table A1 in the Appendix).

Overall, the campaign reached 424,000 Arabic speakers (in Berlin and Germany combined), 268,000 Turkish speakers, and 158,000 Russian speakers. We were able to reach a substantial amount of people within a short time frame. Within 27 days, the campaign reached 95% of Arabic speaking Facebook users in Berlin, 27% of Arabic speaking Facebook users in all of Germany, 19% of Turkish speaking Facebook users in Germany, and 25% of Russian speaking Facebook users in Germany (see Table 2). Users saw the targeted advertisements, on average, two times. This finding highlights the large potential for local authorities in cities or municipalities to leverage the power of social media as large proportion of users can be reached fast at low cost.

Table 2: Online campaign reach relative to Facebook population within 27 day period

Location	Target Language Group	Reached by the Campaign	Total # of Facebook Users	% Reached
Berlin	Arabic	100,500	105,700	95
Germany	Arabic	323,500	1,200,000	27
	Turkish	268,400	1,400,000	19
	Russian	157,700	638,300	25
Subtotal	Germany	749,600	3,238,300	
Total (Excluding German Speakers)		851,000	3,344,000	

VACCINE APPOINTMENTS BOOKINGS

As described above, the targeted social media advertisements encouraged users to click a link integrated in the advertisement which leads them to information on how to directly book a vaccine appointment in their area (either via phone, online, or walk-in).

Overall, across all advertisements, 17,092 users out of 1,020,244 total users who saw an advertisement clicked on it. This is equivalent to a click rate of 17 out of 1000 users (or 1.7%). While this may appear low at first sight, it is considerable given 1) that many users may be generally hesitant to click on advertisements on Facebook and 2) 68% of the German population was already fully vaccinated at the start of the study (as of 25 November 2021). The level of engagement with the advertisements in our campaign was comparable with average engagement in campaigns across industries.⁵

Furthermore, considering the low costs associated with the campaign, such a click rate could amount to increased crude numbers of users clicking on the vaccine appointment links if scaled up to larger audiences (see next section).

The click rate was comparable across age groups as well as across male and female users (see Table A1). The click rate was higher among Arabic-speaking users (20 out of 1000) compared to other language groups.

For the campaign in Berlin, we were able to track how many people visited the “book your appointment here” page on our customized website. In Berlin, approximately 53% of users who clicked on advertisements in Berlin (i.e. 9158 users) visited our website and (presumably) attempted to book an appointment, including 4463 Arabic speakers, 1919 Turkish speakers, 1247 Russian speakers, and 1329 German speakers.

If just 20% of those that visited the COVID-19 vaccine booking website eventually received the vaccination, overall, the campaign in Berlin and Germany, would have together achieved 1832 vaccinations (68 per day).

⁵ In online advertising, engagement is commonly measured by the Click Through Rate (CTR) which refers to the number of link clicks of an ad received compared to the number of impressions (i.e. the number of times any user has seen the ad on their feed). The average CTR across industries is estimated to be 0.9% (9 in 1000) (QUELLE HIER). The CTR in our study was 0.9% for Arabic-speakers, 0.8% for German speakers, and 0.5% for Russian and Turkish speakers. For the analysis presented in this study, we use a click rate calculated based on reach (not impressions). Reach is defined as the number of unique users who are exposed to the ad while impressions include the number of times that an individual user has seen the same advertisement).

COST EFFECTIVENESS

The success of a social media campaign depends, apart from content of the advertisements themselves, on how long the campaign runs and how much money is invested to boost the reach of the campaign. A relevant measure of campaign effectiveness is the cost per intended outcome – in our case – COVID-19 vaccinations.

Assuming only 20% of those users that visited the vaccine websites (equivalent to 10% of those who clicked on the advertisements) as a result of our advertisements actually received a vaccination, the cost per likely vaccination would be 4 EUR for the whole sample.⁶ Given the campaign reach predominantly among users 25 to 55 years, the cost per vaccination is slightly higher for older users above 55 years as well as for female users compared to male users. The cost also varies by language group. For example, given the campaign reach, the cost for Russian speakers is almost twice as high (6.2 EUR per vaccination) compared to the cost for Arabic speakers (3.3 EUR per vaccination) reflecting the relative sizes of the populations (on Facebook) and their interest in the content.

The total cost for the 27-day campaign – which likely led to approximately 1800 vaccinations – was 7000 EUR. To put the overall cost in perspective: The estimated average cost of treating an invasively ventilated COVID-19 patient in an intensive care unit in Germany is 32,000 – 33,000 EUR, while the cost for a non-invasively ventilated COVID-19 patient is estimated to be approximately 10,000 EUR.⁷

EFFECTS OF DIFFERENT FORMS OF OUTREACH: LANGUAGE AND MESSENGER

First, we tested the effect of language on the level of engagement with the advertisements (i.e. click rate or the number of users who click on the button “book appointment now” among every 1000 users who have been exposed to the campaign). This analysis allowed us to estimate the extent to which migrant groups are not considered and potentially excluded by official communication and government campaigns which are often limited to German language (Armocida et al., 2021; Crawshaw et al., 2021; Deal et al., 2021).

As expected, we found that translating the vaccine advertisement into the origin language has a substantial (and statistically significant) effect on advertisement engagement. Translated advertisements receive more clicks on respective vaccine booking tools compared to German-only advertisements (133% increase in the overall Germany sample and 70% in the Berlin sample; 67% increase in the Russian speaking sample in Germany; 18% in the Turkish speaking sample in Germany). Differences in

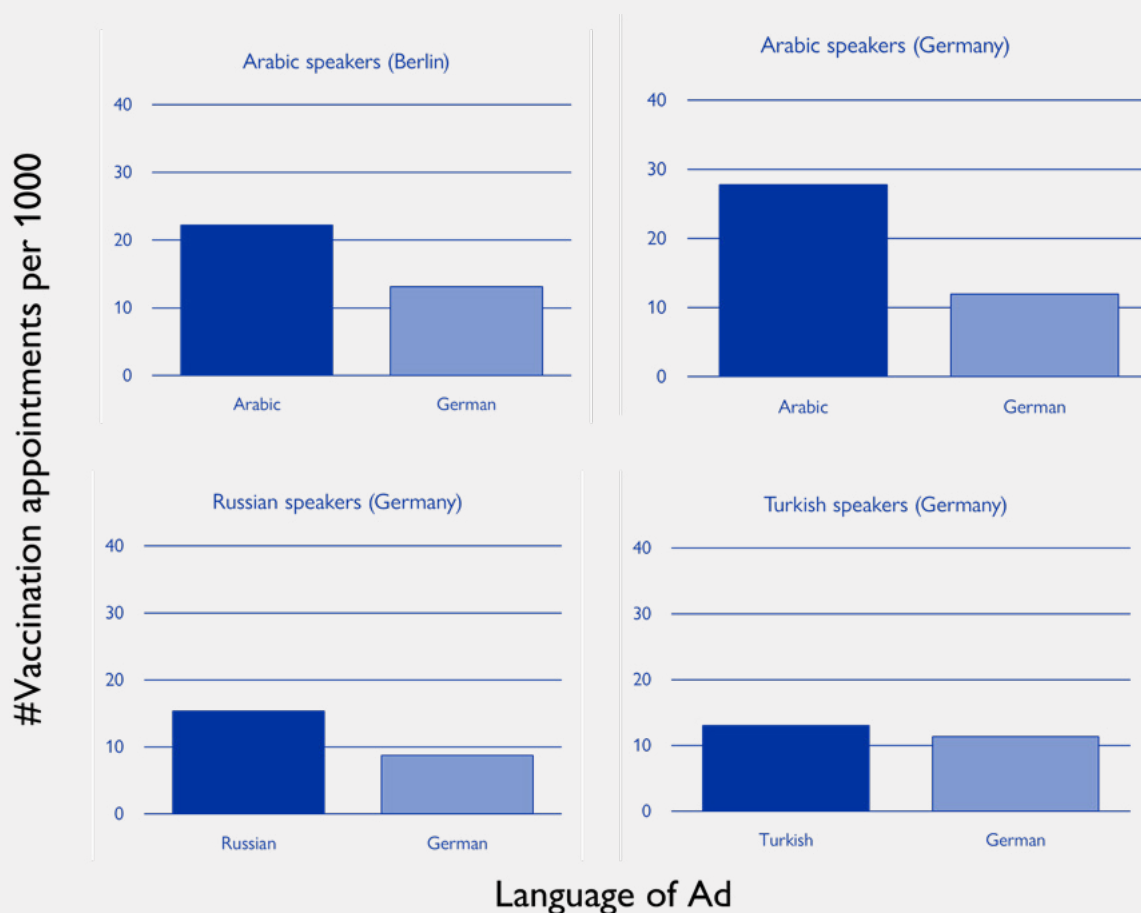
⁶ Excluding research staff costs and start-up costs related to creating the website in Berlin.

⁷ Patient is estimated to be approximately 10,000 EUR.

the effect sizes could also reflect the heterogenous migration profile of Germany. Many Arabic speakers are refugees who recently arrived in Germany with limited German language skills (Brücker, Jaschke, & Kosyakova, 2019). The Turkish migrant community is long-established (BAMF, 2020a). While many may speak Turkish, they also speak German and thus benefit less from translation. The Russian speaking group likely reflects a mix of a smaller group of recent migrants and a larger group of long-settled migrants who likely speak both Russian and German.⁸

⁸ Many Russian migrants arriving in Germany between the 1960s and 1990s were legally categorized as decedents from 'ethnic Germans' who – in previous generations – migrated to Russia (so-called 'Spät-Aussiedler').

Figure 2: Vaccine appointment bookings (ad click rates) by campaign location and language group



Note: Results for Pearson's chi-squared test of differences in proportions: Except for the Turkish group, all differences between German-speaking, Arabic-speaking, and Russian-speaking groups are statistically significant at $p < 0.001$. Effect sizes: Effects sizes relative German group: Arabic ad (Germany) = 133%; Arabic ad (Berlin) = 70%; Russian ad (Germany) = 76%; Turkish group (Germany) = 15%.

The overall effect of providing language translation could be striking if extrapolating the results to broader outreach to migrants. Extrapolating the effect of translating advertisements on Facebook in this study to national vaccination rates in Germany could be roughly equivalent to an increase in vaccination rates from 20% (without translation) to 34% (with translation) among Arabic speakers in Berlin, from 20% to 46% among Arabic speakers in Germany, from 20% to 24% among Turkish speakers in Germany, and from 20% to 33% among Russian speakers in Germany. In other words, for the groups studied, this would be equivalent to an increase in vaccination rates by up to 14 percentage points.⁹ This large 'language' effect could account for observed vaccination gaps between the general population and migrant communities. As such, this finding is consistent with recent survey evidence from Germany suggesting that language skills in addition to income and education fully account for vaccination gaps

⁹ Consider this example to illustrate how effects sizes could be extrapolated to vaccination rates: Assume that 20 out of 100 people were vaccinated due to advertisements without any translation. Our results show that translated advertisements receive 72% more engagement. This would result in 14 additional people being vaccinated (compared to the original 20 people who were vaccinated). In total, 34 out of 100 people would be vaccinated, equivalent to 34%. Increasing the vaccination rate from 20% to 34% is an increase of 14 percentage points.

between migrants and non-migrants (RKI, 2022). Overall, this result highlights the need for governments to improve language-appropriate COVID-19 campaigns.

Second, we tested trust in the “messenger” by varying the person illustrated in the advertisement to be reaching out to the audience (a doctor, politician, religious leader and family). We expected that migrant groups are less likely to engage with an advertisement featuring a politician/official government representative given assumed lower trust in institutions and the government (see background section). In turn, we expected more engagement with the advertisements featuring the religious leader given that some literature suggests that certain migrant groups in Europe are more religious, on average, and respect religious leaders as authority figures in their community (BAMF, 2020b; van Tubergen & Sindradóttir, 2011, p. 280)¹⁰; the doctor¹¹ or the family (given that family plays an important role in migrant communities).¹²

Regarding the effect of the “messenger”, the results contradict expectations in the literature. The results suggest that the ‘government representative’ (see Figure B1) produces a higher number of COVID-19 vaccine appointments compared to other messengers (doctor, religious leader, family) for Arabic speakers (103%) and Russian speakers (37%). Further interviews with representatives from the migrant community in Berlin provided a possible explanation for this result: A large share of Arabic speakers in Germany are recent refugees. Having received protection from the Government of Germany, the relative stability and reliability of government services relative to instable situations that refugees escaped may mean that trust in the German government is high.¹³ This finding is consistent with recent survey evidence showing that migrants’ trust in the government during the COVID-19 pandemic is higher than the trust of non-migrants. Overall, 75% of the surveyed people with a migration background tended to or even strongly trusted the government and politics in Germany. After the lockdown, the value even rose to 83 percent (SVR, 2020).

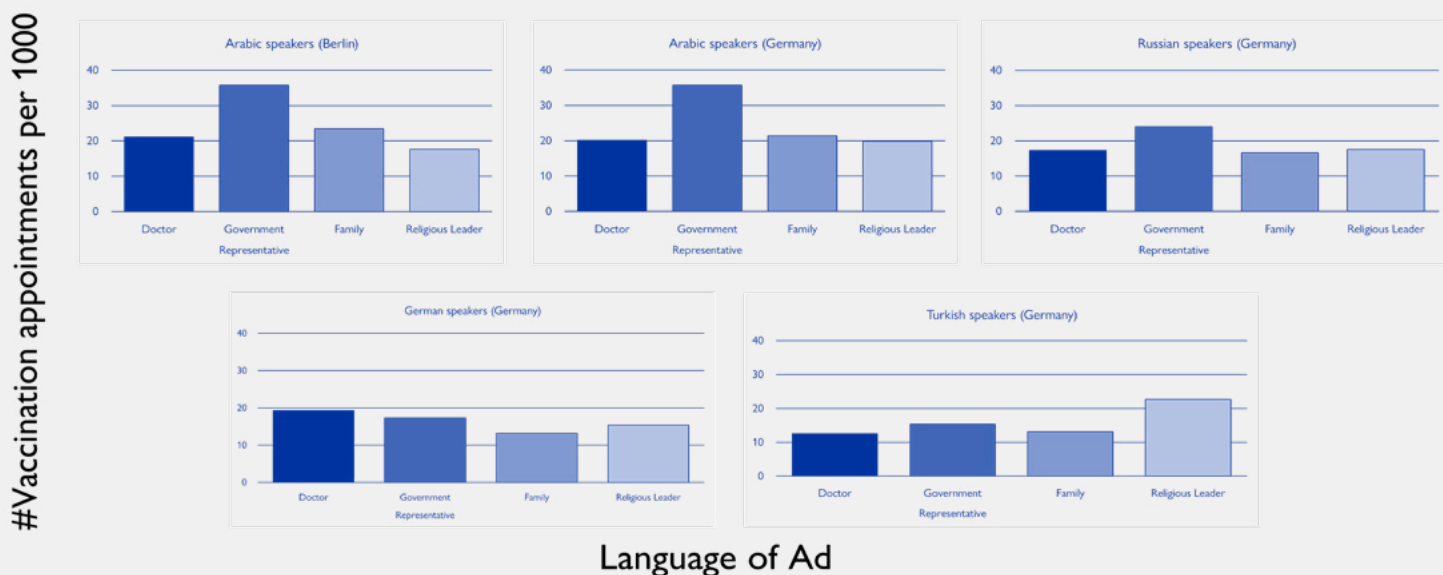
¹⁰An analysis by the German Federal Office for Migration and Refugees (2020) showed that for 74% of refugees, religion plays an important or very important role in their life (BAMF (2020b))

¹¹An evaluation by the Institute for Nursing Science at the University of Bielefeld showed that doctors are seen as persons of respect by Russian and Turkish migrants in Germany and enjoy a high level of trust among their patients (Schaeffer, D., & Horn, A., (2013)).

¹²An analysis published by the Konrad Adenauer Foundation emphasized that the importance of family is especially high in migrant communities in Germany, which is also supported by the results of the 2017 microcensus and the results that 64% of people with a migrant background live with families, while only 44% of the non-migrant population live with families (Henry-Huthmacher and Hoffmann (2021)).

¹³The 2016 IAB-BAMF-SOEP Refugee Survey by the Federal German Office for Migration and Refugees found that 96% of refugees in Germany believe a democracy is the best form of government, 96% believe in free elections and 93% in civil rights (Brücker, Rother, and Schupp (2017)).

Figure 3: Vaccine appointment bookings (Ad click rates) by messenger, campaign location and language group.



Note: Results for Pearson's chi-squared test of differences in proportions: Arabic speakers (Germany): Politician statistically different from all other groups ($p < 0.001$), remaining groups not statistically significant. Arabic speakers (Berlin): Statistically significant differences between Politician and all others ($p < 0.001$). Russian-speakers (Russian): Politician statistically significant different from all other groups ($p < 0.001$), remaining groups not statistically significant. Turkish-speakers (Germany): Religion statistically significant from all groups at $p < 0.001$. Effect sizes: Arabic speakers (Berlin): Effect of Politician vs. Family = 102.8%; Arabic speakers (Germany): Effect of Politician vs. Family = 80%; Russian speakers (Germany): Politician vs. Religion: 36.7%; Turkish speakers: Religion vs. Doctor = 80%; German speakers (Germany): Doctor vs. Family = 47.1%.

The results regarding differences between groups (see Figure 3) also highlight that the effectiveness of messengers may vary for different groups underlying the need for tailored campaigns. For example, the religious leader was the most effective “messenger” for the Turkish speaking group whereas the doctor was the most effective “messenger” for the German speaking group.

LIMITATIONS

This study faced several limitations:

First, even though Facebook has a broad userbase and the platform allows campaigns to be targeted to specific audiences, certain demographic groups may be left out, including children and teenagers under 18 years, adults over 65 years, as well as populations without internet access. Alternative media channels for disseminating vaccination campaigns such as radio, television or posters each face their own constraints of excluding specific audiences. Additionally, mainstream radio and television channels often only operate in the host-country language, billboards and posters are geographically limited and could be challenging due to language literacy. No medium can be seen as a universal solution to reach the target population and the risk to exclude particular vulnerable groups remains. Instead, it is important to design complementary offline outreach strategies to reach populations who we might not be able to reach online.

Second, the identification of who is a migrant on Facebook is imperfect. We used the language that users use when using Facebook to indicate whether someone is a likely migrant or not. While this is not ideal, the ability to approximate migrant status is likely better on such online platforms compared to traditional campaigns which often have less information on who will be exposed to funded advertisements. Moreover, this study only focuses on three migrant groups (Arabic speakers, Turkish speakers, and Russian speakers). Other large groups are currently excluded (e.g. Polish speakers, Rumanian speakers, Bulgarian speakers, Farsi speakers etc. in Germany) and should be considered in future research.

Third, measuring advertisement effectiveness does not provide exact information on who eventually received the vaccine. This is due to the fact that information and vaccination appointments in different languages are scattered across various websites and institutions which makes it difficult to track. While we could measure who left Facebook and visited the respective website to use a vaccine appointment booking tool (i.e. our customized website for the Berlin sample and the governmental website for the Germany sample), we could not measure who actually followed through with making a vaccination appointment and got vaccinated. The possibility remains that people who booked a vaccination appointment may have not attended them or changed

their mind about getting vaccinated for various reasons. Future cooperation with providers of online medical appointment tools and stakeholders of various websites could help to track online conversions more effectively and collect more data on user behaviour. Furthermore, some users might have clicked on our advertisement out of curiosity about the project even though they are already vaccinated or potentially critical about proactive vaccine advertisements. This is why a conservative estimate of 20% of all respective website visits was applied to estimate the number of likely vaccine appointment bookings. In comparison, alternative media channels are affected by this problem to a larger degree. television, billboard, poster and radio campaigns usually do not track who and how many are inspired to book a vaccination appointment as a result of exposure to their content.

To measure advertisement effectiveness in offline settings is also more expensive compared to online settings. This limitation is important to consider when designing complementary offline outreach strategies to reach populations who were not reached online.

Third, we created a profile on Facebook and created our own website (for the Berlin sample) to be able to target advertisements and track websites visits. Naturally, the new brand we created did not enjoy any brand recognition or trust among Facebook users. To avoid any partiality or bias in how the campaign is perceived, we attempted to create a new and neutral profile that no one recognized. It is likely that known and trusted actors, particularly health authorities, would have attracted even more engagement using a similar campaign, further increasing cost-effectiveness.

CONCLUSION & POLICY RECOMMENDATIONS

4



Urgent calls have been launched to provide equitable access to vaccines and improve outreach to migrants. However, the empirical evidence on effective strategies is limited. Future governmental campaigns should allocate sufficient funding for evaluations and share results publicly, especially as many official campaigns are funded by tax-payer money.

The results from this COVID-19 outreach study show that social media campaigns can be an effective, low-cost approach to promoting vaccinations among populations such as migrants – a group with often higher access barriers. National institutions, local authorities and migrant outreach organizations may benefit from the power and cost effectiveness of multilingual social media campaigns because they can target a large percentage of target groups at a low cost.

The study finds a substantial positive effect of translating COVID-19 outreach materials on vaccine appointments. Governments in many countries may exclude a large fraction of their population if they do not make information about vaccinations and how to access them available in the language of migrant groups, especially of recent migrants. In addition to promoting equitable health outcomes, including migrant groups in vaccination outreach could increase overall population vaccination rates and, thus, improve the progress of national vaccination programmes.

Against common claims in the literature, the results showed more engagement with advertisements showing public officials/government representatives compared to other messengers such as doctors, families or religious leaders among those which may be more recent migrants (i.e. Arabic-speakers). This could indicate that the officials are perceived to be more “trustworthy” among certain migrant groups.

As the results vary slightly between different migrant groups, it is important to customize campaigns to specific migrant groups and demographics. This requires knowledge of the target population that may be gathered prior to campaigns through interviews with local stakeholders.

The impact of social media campaigns is likely to be greatest early on in an outbreak. Mistrust builds over time and is spurred by misinformation amassing online. The earlier official information reaches the target group, the less room there is for doubt to spread. Migrants who take up the vaccine early may become advocates in their social circles.

FUTURE RESEARCH

The methodology employed in this study is easily scalable to other countries hosting migrant or refugee populations and additional migrant groups within countries.

Further research should investigate how the sender (i.e. the profile name and recognition) drives engagement as different institutions may enjoy more or less trust with different audiences. Campaigns could try out other content variations such as videos or using influencers/celebrities to increase engagement with advertisements. Additional resources would also allow the study to be complemented with a hotline/chat component where interested users could ask questions about the vaccine online in various languages. The comment and message functions in social media channels could also be used to gather further qualitative data and gain a deeper understanding of the reasons for vaccine access barriers, vaccine hesitancy and understand which sources unvaccinated people use to inform their hesitancy.

Other platforms should also be explored to target populations such as TikTok and Instagram (e.g. for younger generations). Lastly, building more engagement and exchange networks among stakeholders – online and offline - could support data collection efforts and help to “deep dive” more into the behaviour of campaign audiences among key target demographics.

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ANNEX



Figure A1: Language Test (Testing German vs. Arabic/Turkish/Russian)

The image displays two side-by-side screenshots of Facebook advertisements for Vivarum, illustrating a language test. The left ad is in Arabic, and the right ad is in German. Both ads feature a family photo and a 'LEARN MORE' button.

ARABIC LANGUAGE

Vivarum Sponsored · 🌐

هل تم تطعيمك بعد؟
ببساطة احجز موعد تطعيم بالقرب منك الآن.

حماية عائلتك وأصدقائك.
احجز موعد التطعيم الآن.

WWW.ZUSAMMENGEGENCORO...
اضغط هنا للحصول على موعد التطعيم

LEARN MORE

Like Comment Share

GERMAN LANGUAGE

Vivarum Sponsored · 🌐

Bist du schon geimpft? Jetzt ganz einfach einen Impftermin in deiner Nähe buchen.

SCHÜTZE DEINE FAMILIE
UND FREUNDE.
BUCH JEZT DEINEN IMPFTERMIN.

WWW.ZUSAMMENGEGENCORO...
Hier geht's zum Impftermin:

LEARN MORE

Like Comment Share

Source: Vivarum Facebook Ad Manager, 2022

Figure A2: Messenger Test – Testing different messenger images
(Family vs. Doctor vs. Religious Leader vs. Government Representative)

Vivarum
Sponsored · 🌐

Bist du schon geimpft? Jetzt ganz einfach einen Impftermin in deiner Nähe buchen.



**SCHÜTZE DEINE FAMILIE UND FREUNDE.
BUCHÉ JETZT DEINEN IMPFTERMIN.**

ZUSAMMENGEGENCORONA.DE
Hier geht's zum Impftermin [LEARN MORE](#)

👍 Like 💬 Comment ➦ Share

FAMILY

Vivarum
Sponsored · 🌐

Bist du schon geimpft? Jetzt ganz einfach einen Impftermin in deiner Nähe buchen.



**SCHÜTZE DEINE FAMILIE UND FREUNDE.
BUCHÉ JETZT DEINEN IMPFTERMIN.**

ZUSAMMENGEGENCORONA.DE
Hier geht's zum Impftermin [LEARN MORE](#)

👍 Like 💬 Comment ➦ Share

DOCTOR

Vivarum
Sponsored · 🌐

Bist du schon geimpft? Jetzt ganz einfach einen Impftermin in deiner Nähe buchen.



**SCHÜTZE DEINE FAMILIE UND FREUNDE.
BUCHÉ JETZT DEINEN IMPFTERMIN.**

ZUSAMMENGEGENCORONA.DE
Hier geht's zum Impftermin [LEARN MORE](#)

👍 Like 💬 Comment ➦ Share

RELIGIOUS LEADER

Vivarum
Sponsored · 🌐

Bist du schon geimpft? Jetzt ganz einfach einen Impftermin in deiner Nähe buchen.



**SCHÜTZE DEINE FAMILIE UND FREUNDE.
BUCHÉ JETZT DEINEN IMPFTERMIN.**

ZUSAMMENGEGENCORONA.DE
Hier geht's zum Impftermin [LEARN MORE](#)

👍 Like 💬 Comment ➦ Share

GOVERNMENT REPRESENTATIVE

Source: Vivarum Facebook Ad Manager, 2022

Figure A2: Messenger Test – Testing different messenger images
 (Family vs. Doctor vs. Religious Leader vs. Government Representative)

Vivarum
Sponsored · 🌐

هل تم تطعيمك بعد؟
ببساطة احجز موعد تطعيم بالقرب منك الآن.

**حماية لعائلتك وأصدقائك.
احجز موعد التطعيم الآن.**

WWW.ZUSAMMENGEGENCORO...
اضغط هنا للحصول على موعد التطعيم

LEARN MORE

Like Comment Share

FAMILY

Vivarum
Sponsored · 🌐

هل تم تطعيمك بعد؟
ببساطة احجز موعد تطعيم بالقرب منك الآن.

**حماية لعائلتك وأصدقائك.
احجز موعداً للتطعيم الآن.**

WWW.ZUSAMMENGEGENCORO...
اضغط هنا للحصول على موعد التطعيم

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DOCTOR

Vivarum
Sponsored · 🌐

هل تم تطعيمك بعد؟
ببساطة احجز موعد تطعيم بالقرب منك الآن.

**حماية لعائلتك وأصدقائك.
احجز موعداً للتطعيم الآن.**

WWW.ZUSAMMENGEGENCORO...
اضغط هنا للحصول على موعد التطعيم

LEARN MORE

Like Comment Share

RELIGIOUS LEADER

Vivarum
Sponsored · 🌐

هل تم تطعيمك بعد؟
ببساطة احجز موعد تطعيم بالقرب منك الآن.

**حماية لعائلتك وأصدقائك.
احجز موعداً للتطعيم الآن.**

WWW.ZUSAMMENGEGENCORO...
اضغط هنا للحصول على موعد التطعيم

LEARN MORE

Like Comment Share

GOVERNMENT REPRESENTATIVE

Source: Vivarum Facebook Ad Manager, 2022

Figure A2: Messenger Test – Testing different messenger images
 (Family vs. Doctor vs. Religious Leader vs. Government Representative)

Vivarum
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Вы еще не сделали прививку? Просто запишитесь на вакцинацию прямо сейчас рядом с вами.



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Source: Vivarium Facebook Ad Manager, 2022

Figure A2: Messenger Test – Testing different messenger images
(Family vs. Doctor vs. Religious Leader vs. Government Representative)

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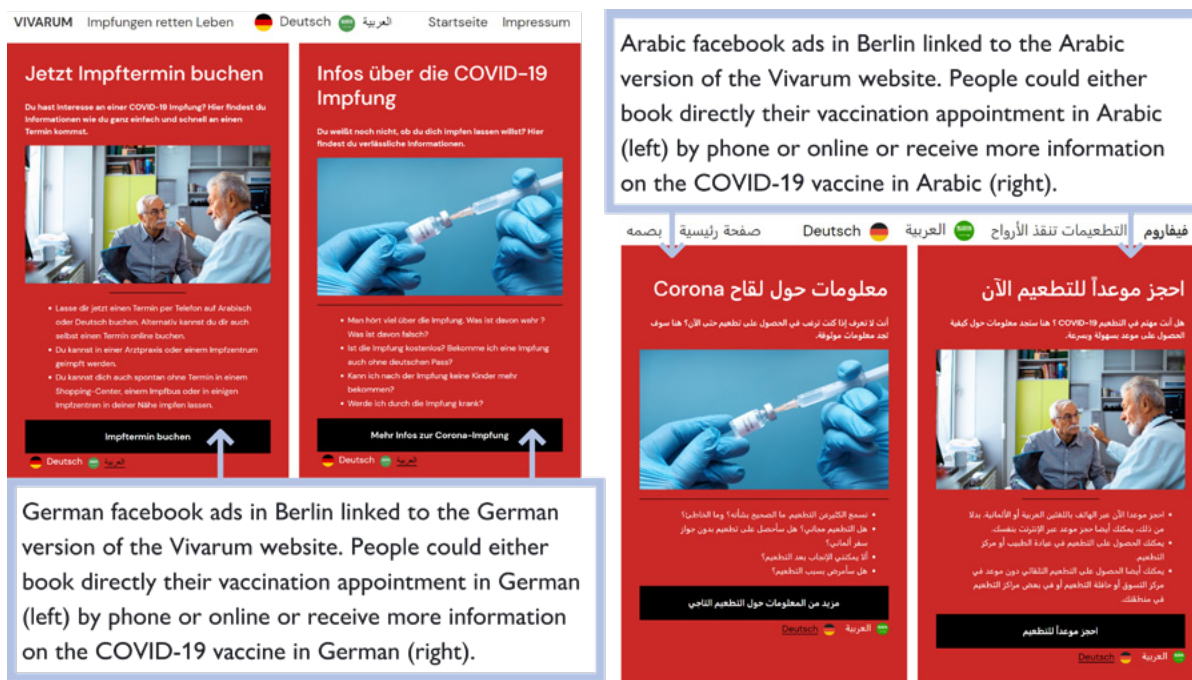
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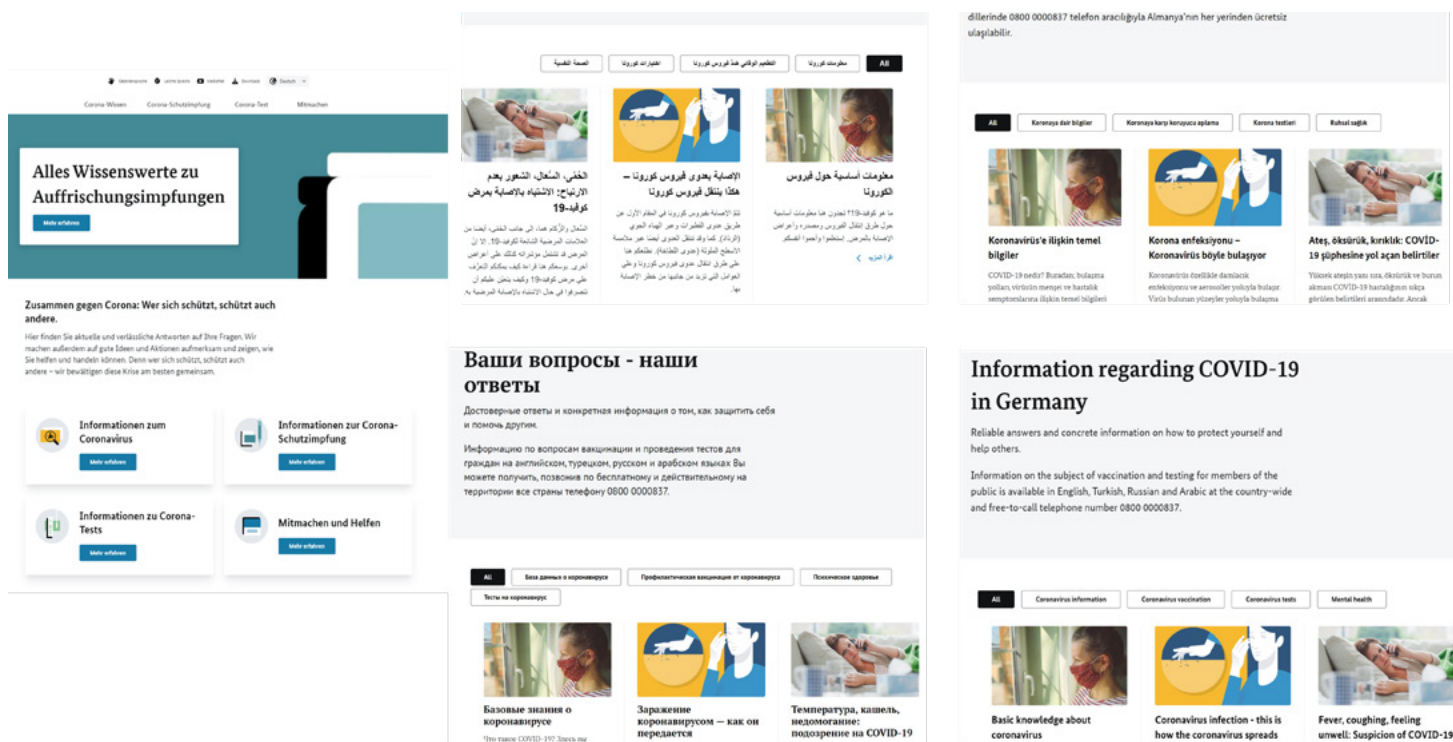
Source: Vivarum Facebook Ad Manager, 2022

Figure B1: Vivarum website screenshot (available in German/Arabic)



Source: Vivarum.org, 2022. This website was created by the authors to track appointment bookings.

Figure B2: "Zusammen gegen Corona" – Website (in German/Arabic/Turkish/Russian/English)



Source: German Federal Ministry of Health – zusammengegencorona.de, 2022

Table A1: Description of the study sample, campaign reach and key outcomes

Demographic	Total Reach	Spending (EUR)	Unique Clicks on Ads	Unique clicks per 1000 reached	Appointment website visitors*	Estimated # of vaccinations**	Cost per vaccination (EUR)
Total	1.020.244,0	7.274,9	17.092,0	16,8	9.158,4	1.831,7	4,0
18-24	40.564,0	268,3	612,0	15,1	327,9	65,6	4,1
25-34	219.337,0	1.348,7	3.349,0	15,3	1.794,5	358,9	3,8
35-44	244.780,0	1.491,8	3.834,0	15,7	2.054,4	410,9	3,6
45-54	226.360,0	1.583,8	3.779,0	16,7	2.024,9	405,0	3,9
55-64	177.120,0	1.414,0	3.121,0	17,6	1.672,3	334,5	4,2
65+	112.082,0	1.168,3	2.397,0	21,4	1.284,4	256,9	4,5
female	407.830,0	3.111,7	6.565,0	16,1	3.517,7	703,5	4,4
male	607.796,0	4.134,0	10.468,0	17,2	5.609,0	1.121,8	3,7
unknown	4.618,0	29,1	59,0	12,8	31,6	6,3	4,6
arabic	423.932,0	3.085,1	8.702,0	20,5	4.662,8	932,6	3,3
german	170.263,0	1.118,3	2.480,0	14,6	1.328,9	265,8	4,2
russian	157.694,0	1.537,0	2.328,0	14,8	1.247,4	249,5	6,2

Note: Conversions from those who clicked on the ad on Facebook to visiting the appointment booking tool (53%) was measured for the Berlin sample and later applied to the full sample. ** The number of vaccinated are conservatively estimated to be 20% of those visiting the booking tool.

