



REVIEW

Lithuanians' perceptions of vaccination and their sources of information: a literature review

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Abstract

Objectives Attitudes toward vaccination are important drivers of vaccination decisions and behavior. But researchers have pointed to the shortage of such studies on Eastern Europe.

Methods A literature review of 14 survey studies was conducted.

Results The review showed that Lithuanians' attitudes toward vaccines appear to be volatile with considerable discrepancy between views about the importance of vaccines and their perceived effectiveness and safety. Perceptions of vaccine risks are high, with Lithuanians challenging both specific vaccines (children's, flu) and vaccination in general. Lithuanians' perceptions of vaccine importance are among the lowest in the EU (23rd out of 28 countries).

Conclusions Lithuanians do not entirely reject vaccines, but many are worried about their health impact. More studies are needed to explore vaccine perceptions in Lithuania and potential factors shaping those, like media representations.

Keywords Public attitudes · Health communication · Vaccination · Lithuania · Survey studies

Introduction

Vaccines are one of the most successful disease preventive measures in the history of public health. In recent years, however, a sizable number of people have become hesitant about vaccination—a development tied to a rise of several diseases. For example, continuous outbreaks of measles have been linked to vaccine hesitancy (Lane et al. 2018; Thornton 2019; WHO 2019). Therefore, scholars have investigated the public's knowledge, attitudes and beliefs about vaccines, which are known to influence vaccine acceptance and behaviors (WHO 2014; Dubé et al. 2013).

But these efforts have not focused on all countries equally. A 2014 review of empirical research on attitudes toward vaccination in Europe noted “a paucity of papers from Eastern Europe” (Yaqub et al. 2014). We aim to fill this gap, providing a review of scholarly literature on public perceptions about vaccines in Lithuania.

The case of Lithuania

Lithuania is a northeastern European country, which gained independence in 1990 after several decades of occupation by the Soviet Union. Afterward, Lithuania reintegrated into Western Europe, joined the World Trade Organization, NATO and the European Union and entered the Eurozone in 2015. It has a strong economy and a rapidly growing innovation sector (OECD 2018a) and is among the EU's most educated countries with one of the highest percentages of adults (over 90% of 25–64 year olds) with upper secondary education (Eurostat 2018).

The Lithuanian healthcare system is based on a national insurance model, with the government spending 6.5% of GDP on health services (OECD 2018b). With regard to vaccines, the Lithuanian healthcare system fully compensates children's immunization for 14 diseases including measles, polio and rotavirus infections (ULAC 2019).

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Despite the availability of vaccines and easy access via pediatricians, monitoring of children's vaccination trends in Lithuania between 2003 and 2017 showed a statistically significant decline in the coverage for tuberculosis BCG, hepatitis B and mumps, measles and rubella vaccines (Šebeliauskaitė and Čaplinskas 2018). Decreasing vaccination coverage was partly followed by outbreaks of vaccine preventable diseases like measles (Fig. 1) (ULACa). In 2019 Lithuania reported over 800 cases of measles, making it the single biggest outbreak in the last decade (ULACb). Among European countries, Lithuania had one of the largest numbers of measles cases per 1 million population (ECDC 2019). This makes Lithuania an important case study for understanding and tackling public rejection of vaccination in the European context and beyond.

Although vaccine hesitancy depends on various factors, Lithuania's sociohistorical context stemming from the Soviet era may be important. According to Hoch (1997), the ability to control infectious diseases in the Soviet Union was perceived as an indicator of state superiority, resulting in strong-arm governmental programs flanked by health campaigns emphasizing vaccines as a public good and economic benefit. This legacy may have an ambivalent influence on Lithuania: While it has a strong history of mandatory vaccination in Soviet times, Lithuanians have turned away from this historical phase in many ways by orienting toward civil liberties—potentially including those toward vaccination.

Therefore, the primary goal of this paper was to understand what Lithuanians think about vaccines and how their beliefs evolved over time. While several studies have surveyed vaccine-related perceptions in Lithuania, no study has integrated and reviewed them systematically. We have

done so, focusing on Lithuanians' perceptions of the general importance of vaccination, their safety and effectiveness—i.e., core attitudinal factors that are known to be linked to vaccination behavior (Opel et al. 2011) and relate to the foundational narratives of the anti-vaccine movement which has questioned all of these dimensions (Smith 2017). Additionally, we reviewed the most common sources of information about vaccines among Lithuanians, to identify communicative avenues on which the public including vaccination skeptics might be addressed.

Methods

As shown in Fig. 2, data were collected in several steps: (1) a keyword search in scholarly publication databases and the World Wide Web; (2) cross-referencing of eligible records from Step 1 for identification of additional records. For the keyword search, we used the Vilnius University online library, which provides consolidated access to scholarly publications indexed in over 90 national and international databases such as Web of Science, Springer LINK or MEDLINE, as well as the Lithuanian Academic Electronic Library, a national open access repository of Lithuanian publications. Keywords used for the search are shown in Fig. 2 and detailed in Supplemental material. Records identified in Step 1 were initially screened by title, abstract and/or content to determine their suitability for further analysis. Records were included if they studied data related to public awareness, knowledge, attitudes, opinion and/or perception of vaccines in Lithuania. If this could not be determined based on title, abstract or a preliminary screening of the content, the full text was read (see Fig. 2

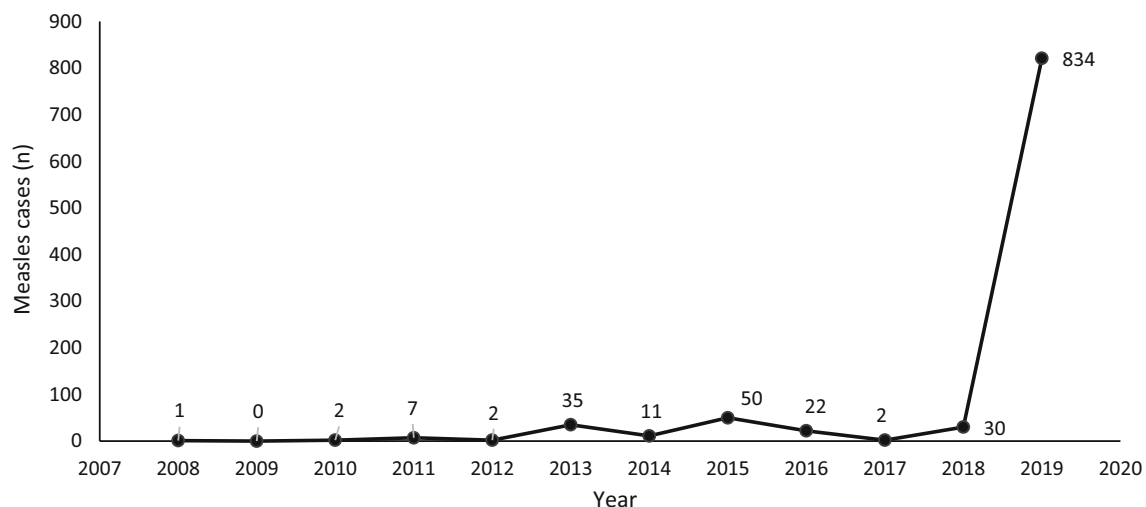
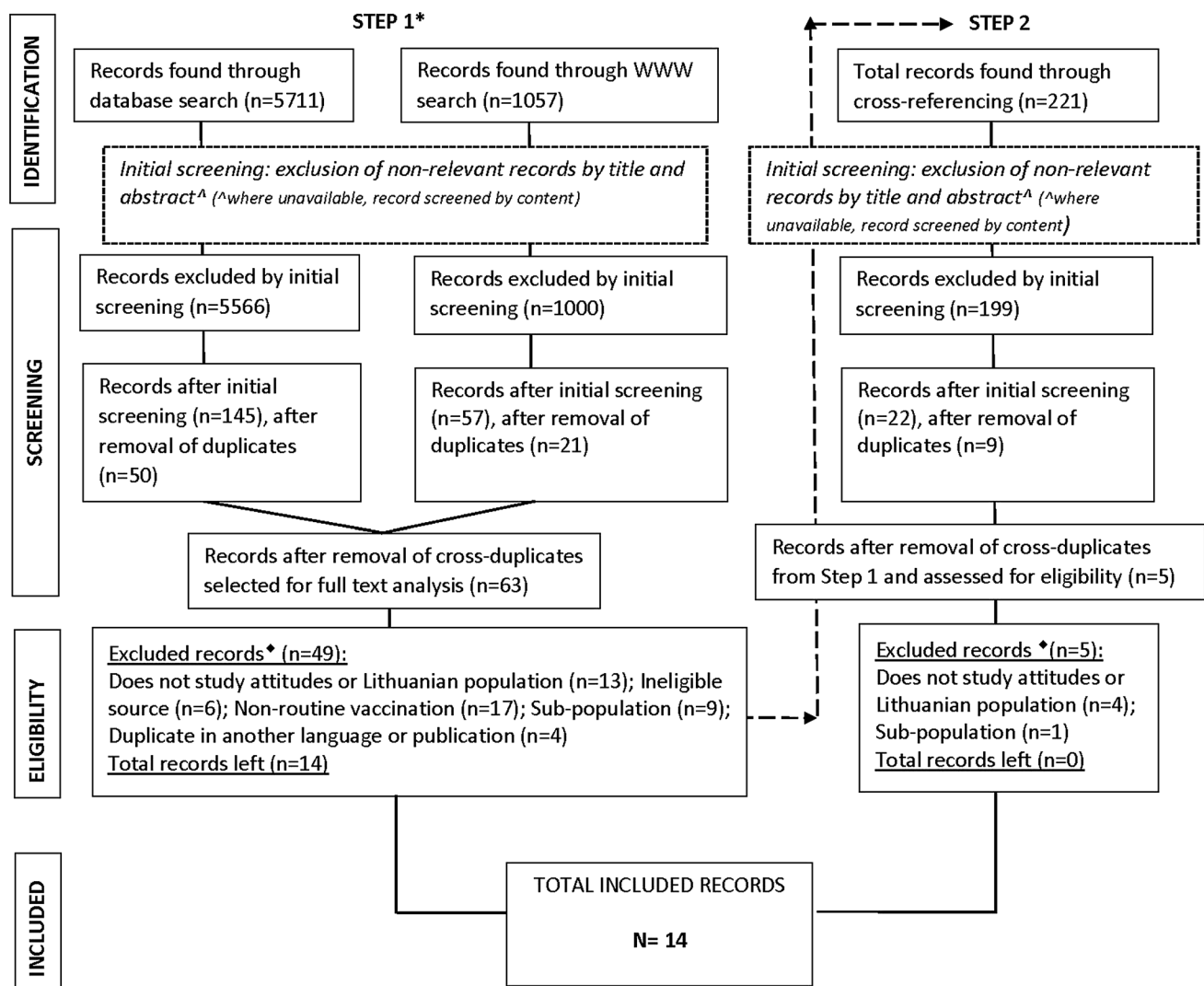


Fig. 1 Measles cases in Lithuania in 2008–2019, official statistical data from the Center for Communicable Disease and AIDS in Lithuania (Užkrečiamų ligų ir AIDS centras) (ULAC a)



The following search strings, denoting Lithuanian equivalents of terms “public attitudes/ opinion/ views/ beliefs about vaccination” were used during Step 1 to search for records in Lithuanian: visuomen požiūri* skiep*; visuomen* nuomon* skiep*; visuomen* požiūri* vakcin*; visuomen* nuomon* vakcin*; visuomen* požiūri* imunoprofilaktik*; visuomen* nuomon* imunoprofilaktik*. The following keyword search strings were used to search for records written in English: attitude* vaccin* Lithuania*; belief* vaccin* Lithuania*; opinion* vaccin* Lithuania*; perception* vaccin* Lithuania*; view* vaccin*; knowledge vaccin* Lithuania*; attitude* immuniz* Lithuania*; belief* immuniz* Lithuania*; opinion* immuniz* Lithuania*; perception* immuniz* Lithuania*; view* immuniz* Lithuania*; knowledge immunization* Lithuania*.

***Inclusion criteria:**

1. Record includes survey items or indirect measurements of public attitudes of Lithuanians on vaccine importance, effectiveness and safety;
2. Record accessible via peer-reviewed scholarly publications, conference proceedings, national/international reports or opinion polls;
3. Record focuses on routine human vaccinations or vaccination in general.

Exclusion criteria:

1. Record is a BA/MA thesis;
2. Record focuses on expert sub-populations (health care workers, medical students);
3. Unverifiable source;
4. Duplicate record.

Fig. 2 Data collection flowchart

for detailed inclusion/exclusion criteria). The final number of studies included in this review was $n = 14$.

Results

All 14 studies included in this review were quantitative surveys (Table 1). Eleven focused on public attitudes toward children's vaccines, several vaccines (e.g., MMR and Flu) or vaccines in general; 3 focused on public attitudes toward flu vaccines (see Supplemental material for studies on the flu vaccine). All surveys were cross-sectional; i.e., no longitudinal data was available for Lithuania. Most studies done nationally did not use representative samples, limiting their generalizability, but as they still provide valuable insights, they were included in the review.

Importance of vaccines

The earliest survey on Lithuanians' perceptions of vaccines was conducted in 2003/2004 with inhabitants of Lithuanian capital city Vilnius (Žagminas et al. 2007; Table 1). It showed that a large majority (89%) of respondents agreed on the necessity of children's vaccines and a similar proportion (88.6%) believed that children should be vaccinated according to the recommended immunization schedule. The first nationally representative survey was carried out in 2011. In contrast to the first study, it demonstrated that nationally, only 54% supported the use of vaccines for preventing infectious diseases and that 32% expressed negative views toward their use (Baltijos tyrimai 2011, Čaplinskas et al. 2011). In 2013 (Kuprevičienė and Žagminas 2014), a second nationally representative study was conducted on Lithuanians' intention to vaccinate against flu, diphtheria and tetanus. It found that only 49.8% of respondents had positive attitudes toward vaccination for diphtheria and tetanus, which is given to adults but routinely also to children.

Over the next 5 years, perceptions of vaccine importance were analyzed in several small-scale studies. Šeškutė et al. (2018) found that the overall opinion of postpartum mothers on children's vaccines in Kaunas was positive (83.2%). Lidžiūtė and Stasiuvienė (2015) surveyed parents in Klaipėda, the third biggest city in Lithuania, in which 97.3% of respondents said vaccination was important for their children, but only 74.2% of respondents in the survey thought that children should be immunized according to the recommended schedule. In 2015, Kriščiūnienė et al. (2016) surveyed inhabitants of Tauragė and its surrounding district—a small Lithuanian town with some 40,000 inhabitants. The sample was representative for the town's population. The survey did not measure attitudes toward vaccine importance directly, but revealed variances in

vaccine perceptions between demographic groups: almost every second resident (53%) believed most Lithuanians were skeptical about vaccination, particularly rural residents. In 2016, Nevulienė et al. (2018) conducted an online survey with 425 respondents and while the survey once again did not measure perceptions of vaccine importance directly, it found that 17.4% of respondents believed that diseases for which vaccines are used have been eradicated, rendering vaccines for children unimportant (70.1% of respondents disagreed with the statement).

Since then, three internationally comparative, representative surveys have examined Lithuanians' perceptions of vaccines. An online survey conducted for the EU Vaccine Confidence Project in May 2018 revealed that between 2011 and 2018, perceptions of vaccines in Lithuania improved considerably, with roughly 87% of respondents agreeing that vaccines were important for children. The general importance of vaccines and the importance of specific vaccines were rated differently; while 87% of respondents perceived vaccines to be generally important, only 50% found vaccines against seasonal influenza important.

Surprisingly, a second nationally representative survey carried out 6 months later—conducted with a different method, using face-to-face interviews but also asking for the importance of vaccinating children—showed a sharp decrease in perceived vaccination importance (Fig. 2). Compared to 87% of Lithuanians in May of 2018, only 69% in October agreed that vaccines for children were important (Wellcome Global Monitor 2019) (Fig. 3).

In March of 2019—after another half-year interval, again using face-to-face interviews, but this time asking about vaccination for both children and adults—the Eurobarometer showed that 87% of Lithuanians thought that “it is important for everyone to have routine vaccinations.” The interpretation of these varying results is difficult, as sampling methods and survey questions differed, and as Lithuania experienced the largest measles outbreak of the last decade right after the second survey (2019, $N = 834$), potentially influencing the Eurobarometer results.

Effectiveness

Ten studies analyzed what Lithuanians think about vaccine effectiveness. With the exception of one survey (see Baltijos tyrimai (2011) in Table 1), results indicate different perceptions of vaccine importance versus perceptions of effectiveness across all surveys and the entirety of the country. While vaccine importance is generally seen as high, evaluations of vaccine effectiveness are more critical.

Žagminas et al. (2007) found that in 2003/2004, only 62.7% of Vilnius inhabitants thought that vaccines are more effective and less expensive compared to other

Table 1 Research studies analyzing public perceptions of vaccines in Lithuania (survey questionnaire items presented in original and translated formulations)

Year of survey	Author	Sample size	Sample scope	Attitudinal measures (percentage of respondents that strongly agree and tend to agree with the given statement)			Information sources
				Safety	Effectiveness	Importance	
2003–2004	Žagminas et al.	2743	Vilnius	Are vaccines given to children safe? (66.7)	Are vaccines more effective and less expensive than other medical services? (62.7) Vaccines always warrant protection against infectious diseases (35.9)	Is children's vaccination essential? (89.0)	Medical institution (92.2); TV, radio (38.2); print media (38.1); brochure (32.9); books (31.9); friends (31.9) Internet (19.1)
2011	Baltijos tyrimai; Čaplinskas et al.	1009	Nationally representative		Vaccines are an effective means of protection against diseases (60.0) Vaccines are effective, but only in cases of few diseases (67.0) Effectiveness of vaccines is questionable and their promotion is only beneficial for pharmaceutical companies (53.0)	Do you agree or disagree with the use of vaccines for protection against infectious diseases (54.0)	Doctors (58.0); TV/radio (42.0); friends, family (33.0); print media (20.0); Internet (15.0)
2013	Kuprevičienė et al.	945	Nationally representative		Vaccines are a good thing, because after getting vaccinated I don't have to worry about getting sick; vaccines reduce the probability of getting sick; after getting vaccinated I would give to visit my doctor much less often (42.7) Do vaccines effectively protect your child from the diseases? (57.3)	Positive opinion on vaccination for diphtheria and tetanus (49.8)	
2014	Šeškutė et al.	300	Postpartum mothers in Kaunas hospital	Are the vaccines used for children's immunization safe? (57.0)		Overall opinion of children's immunizations is positive (83.2)	Doctor (77.3); Internet (52.0); mass media (41.3); medical literature (28.3); friends/family (24.7)
2014–2015	Lidžiūtė et al.	298	Parents of children in daycare centers in Klaipėda		Vaccines always protect against infectious diseases (54.0)	Parents who know that vaccination is important for their child (97.3)	Doctor (94.3); Internet (45.3); books (11.4)
2014	Kriščiūnienė et al.	235	Residents of Tauragė	Vaccines are safe and effective (60.6)		Urban residents: The majority of the society has favorable attitudes toward vaccines (53.0) Rural residents: The majority of the society has favorable attitudes toward vaccines (30.0)	

Table 1 (continued)

Year of survey	Author	Sample size	Sample scope	Attitudinal measures (percentage of respondents that strongly agree and tend to agree with the given statement)			Information sources
				Safety	Effectiveness	Importance	
2016	Nevliutienė et al.	425	Online respondents	Vaccines are not safe (32.0) Respondents who disagree = 58.4 Vaccines contain toxic ingredients (42.4%) Respondents who disagree = 31.8	Vaccines prevent the spread of diseases (63.3)	Diseases, for which vaccines are used, have been eradicated, which means there is no necessity to vaccinate your child (17.4). Respondents who disagree = 70.1.	
2018 May	Vaccine Confidence Project	1018	Nationally representative	Overall, I think vaccines are safe (81.0) Overall, I think the MMR vaccine is safe (78.0)	Overall, I think vaccines are effective (81.4)	Overall, I think vaccines are important for children to have (87.0) Overall, I think the MMR vaccine is important for children to have (86.1)	
2018 October	Wellcome	1000	Nationally representative	Vaccines are safe (52.0)	Vaccines are effective (60.0)	Vaccines are important for children to have (69.0)	
2019 March	Eurobarometer	1004	Nationally representative	Vaccines can often produce serious side effects (55.0)	All of the diseases mentioned earlier are infectious diseases and can be prevented. Do you think that vaccines can be effective in preventing them? (83.0)	Doctor (77.0); other health workers (36.0); family (16.0)	
2019	Žalaitė and Kelbauskienė	716	Respondents from online parent forums; 379 respondents from Lithuania	Children's vaccination is totally safe (60.9)	Vaccines given to children are necessary (67.8)	Family doctor (72.4); Internet (56.5); medical science journals (41.6); general public (25.7); TV (12.8)	



Fig. 3 Results of representative surveys on Lithuanian public opinion toward the importance, effectiveness and safety of vaccines (%) and years of recent measles cases/outbreaks in Lithuania

medical services. Furthermore, only a little more than a third of respondents (35.9%) believed that children's vaccines always protect against infectious diseases. A 2011 survey showed that 67% of Lithuanians believed that vaccines are effective, but only in cases of a few diseases. However, only 60% of respondents in the same survey agreed with the general statement that vaccines are an effective means of protection against diseases and as much as 53% of respondents thought that effectiveness of vaccines is questionable, indicating that respondents are undecided about vaccine effectiveness or that perceptions of effectiveness may vary depending on particular vaccines/diseases (Baltijos tyrimai 2011). A nationally representative study conducted by Kuprevičienė and Žagminas (2014) contained statements about diphtheria, tetanus and flu vaccines which can be seen as indirect measurements of attitudes to vaccine effectiveness (i.e., “vaccines are a good thing... because I don't have to worry about getting sick,” “vaccines reduce the probability of getting sick”) to which only 42.7% of respondents agreed.

In 2014 vaccines' perceived effectiveness was measured among postpartum mothers in a Kaunas hospital, which showed that 57.3% saw vaccines as effective (Šeškutė et al. 2018). A study among Klaipėda parents at roughly the same time came to similar findings (54–60.6%) (Lidžiūtė and Stasiuvienė 2015), while an online survey a year later

showed that 63.3% of respondents believed that vaccines prevent the spread of infectious diseases (Nevulienė et al. 2018). In contrast, a representative online survey from May 2018 showed that public confidence in vaccine effectiveness was at 81.4% (Vaccine Confidence Project 2018). This positive, but rather contradictory result compared to other studies may indicate a bias stemming from the sampling techniques or indicate a spike in vaccine trust. In either case, public enthusiasm regarding vaccine effectiveness was brief: In October 2018, only 60% of Lithuanians indicated that vaccines are effective (Wellcome Global Monitor 2019). Similar to perceptions of vaccine importance, perceptions of vaccine effectiveness were most positive again in April 2019, reaching an all-time high 83% of the population (European Commission 2019)—which may once again reflect the volatility of public opinion or public health alarmism in the aftermath of the large measles outbreak in 2019. Overall, results suggest that 20–40% of Lithuanians are—and have been—doubtful about the effectiveness of vaccines.

Safety

Vaccine safety has been one of the most hotly debated issues among vaccination skeptics. Nine studies between 2003 and 2019 analyzed Lithuanians' perceptions of

vaccine safety, finding results similar to those regarding vaccine effectiveness. Žagminas et al. (2007) found that two-thirds (66.7%) of Vilnius' inhabitants believed vaccines were safe in 2003/2004. The 2011 nationally representative survey did not contain an item on vaccine safety perceptions, but found that 50% of Lithuanians believed the risks of adverse effects from vaccines outweighed their benefits (Baltijos tyrimai 2011). In 2014 Šeškutė et al. (2018) found that 85.3% of surveyed postpartum mothers worried about vaccinating their child with 72.7% of these respondents worrying about possible adverse effects. In sum, only 57% of postpartum mothers in Kaunas believed in vaccine safety. Respondents of Lidžiūtė and Stasiuvienė (2015) were asked a double-barreled question—"I believe that vaccines are safe and effective"—making it difficult to differentiate between safety and effectiveness; nevertheless, only 60% agreed with the statement. In a 2016 online survey 32% of respondents believed vaccines were unsafe (58.4% disagreed with the statement) and 42.4% of respondents believed that vaccines contain toxic ingredients. A subsequent, nationally representative survey found that 81.0% of Lithuanians believed in vaccine safety and a similar number of Lithuanians (78.0%) believed in the safety of the MMR vaccine routinely given to children (Vaccine Confidence Project 2018). As with the perceptions of vaccine effectiveness, this rather contradictory result compared to findings of previously conducted studies measuring vaccine safety may reflect biases stemming from previous non-representative samples or an overall spike in vaccine trust in May 2018. A survey conducted in October of 2018, however, differed, with only 52% of Lithuanians believing in vaccine safety (Wellcome Global Monitor 2019). Although the 2019 Special Eurobarometer did not ask explicitly about vaccine safety, it revealed that 55% believed that vaccines can "produce serious side effects" (European Commission 2019). In sum, these studies outline a divided public. Surveys show consistently that more than one-third of Lithuanians are unsure about vaccine safety.

Information sources

Apart from attitudes toward vaccines, several surveys analyzed the sources from which Lithuanians get information about vaccines: All surveys including this item found that doctors are the most common source of such information. Predictably, surveys measuring the trustworthiness of sources corroborate these findings: doctors are the most trustworthy source among Lithuanians (i.e., Baltijos tyrimai 2011; European Commission 2019). Other common sources of information include the Internet, mass media and friends or family, who commonly advise respondents on vaccines.

The reliance on friends and family as sources illustrates the strong effect of personal networks that are known to influence vaccine hesitancy (WHO 2014). In Lithuania, this is especially evident in small communities like Tauragė, where a 2015 survey revealed that among those who did not vaccinate their children, almost 52% indicated advice from family and friends as a primary determinant for skipping vaccination (Kriščiūnienė et al. 2016).

Despite using various sources, 27% of Lithuanians indicated in 2011 that they felt not sufficiently informed about vaccines (Baltijos tyrimai 2011), and 68.8% expressed the necessity for more trustworthy information in 2014 (Šeškutė et al. 2018). It may be the case that these variations indicate a rising need for more dependable information about vaccination, stemming from the changing media systems and the increasing prevalence of content of problematic quality around science, technology and health issues (Schäfer 2017). In sum, results show that Lithuanians do not feel sufficiently knowledgeable about vaccines and would prefer more information. Apart from healthcare professionals, they refer to a variety of sources such as mass media, Internet and relatives for information about vaccines, but trust doctors for the most accurate information.

How do Lithuanians' perceptions of vaccines compare to other countries?

Three studies included in this review are cross-national, allowing comparisons of Lithuanians' perceptions to other countries (Vaccine Confidence Project 2018; Wellcome Global Monitor 2019; European Commission 2019). A pan-European survey conducted in May 2018 showed that Lithuanians' perceptions of vaccine importance (87.0%) was among the lowest in the EU (average 90.0%), placing Lithuania 23rd out of 28 EU countries on the vaccine importance rating (Vaccine Confidence Project 2018). Lithuania's ranking (23) was slightly below Belgium (22) and above France (24), which has been a European hot-spot of anti-vaccine activism (Ward et al. 2018). Lithuania was also among the EU countries with the lowest confidence in vaccine effectiveness (24th out of 28 countries). On vaccine safety, Lithuania ranked 17th, between Estonia, Romania and Slovenia, which have all since 2010 experienced declining rates of measles vaccination.

The 2018 Wellcome Global Monitor (2019) revealed that on questions of safety, Lithuanians (52%) deviate from Northern Europe, where vaccine safety perceptions lie around 73%, as well as the world average perceptions about the safety of vaccines (79%). This places Lithuanians on par with countries in Eastern Europe (50%, most of which have observed declining vaccine rates over the past decades) and far behind countries in Eastern Africa (92%),

Central America and Mexico (88%) and South Asia (95%) which are highly confident in vaccine safety. On questions of effectiveness, Lithuanians (60%) are again closer to Eastern European countries (65%) than to Northern Europe (84%), and below the world average (84%).

The 2019 Special Eurobarometer showed Lithuanians' perception of vaccine safety (only 32% thought correctly that vaccines do not produce serious side effects) to be well below EU average (41%), and that of neighbor countries, like Poland (45%) (European Commission 2019). Lithuanians (87%), however, were above the EU average (82%) on question of vaccine importance, surpassing countries like Germany (86%) and the UK (85%). It seems like the measles outbreaks in early 2019 considerably affected Lithuanians' attitudes toward vaccination.

Discussion

Scholars from various disciplines have highlighted the importance of public attitudes toward vaccines, as it may lead to suboptimal vaccine uptake (Larson et al. 2016). The present study reviewed public perceptions toward vaccines and their development in Lithuania, which in 2019 faced one of the highest rates of measles cases among European countries (ECDC 2019). Fourteen studies were included, ten domestic and four international projects (see Supplemental material). All were based on standardized population surveys, but most used different methodologies and differently worded questions, hindering comparability. In addition, not all used representative samples. Overall, this signals the need for more representative, and ideally longitudinal research in this area.

The review showed that, first, perceptions of vaccines vary among regions. Three studies conducted within a comparatively similar period showed some variation in perceptions of vaccine importance among parents who lived in three distinct regions of Lithuania (Kaunas, Klaipėda and Tauragė), and—in one of the surveys—among respondents who lived in urban and rural areas (Lidžiūtė and Stasiuvienė 2015; Kriščiūnienė et al. 2016; Šeškutė et al. 2018). This highlights that vaccine-related attitudes should not only be assessed at national but local level as well, and that urban–rural differences should be monitored closely. Such monitoring could help foresee the emergence of skeptical groups and may allow for corresponding public health measures (Kennedy et al. 2011).

Second, results suggest that perceptions of vaccination differ between individual vaccines. Multiple surveys have shown Lithuanians to be critical about the flu vaccine (Vaccine Confidence Project 2018; Kuprevičienė and Žagminas 2014). Compared to perceptions of vaccination in general or MMR vaccine, respondents were less positive

about the safety and effectiveness of flu vaccines (Vaccine Confidence Project 2018).

Third, the results suggest changes over time. The studies using representative data over the past 15 years show that perceptions of vaccine importance in Lithuania were low twice—likely between 2011 and 2013 and in October of 2018 (Baltijos tyrimai 2011; Čaplinskas et al. 2011; Kuprevičienė and Žagminas 2014; Wellcome Global Monitor 2019). At the end of 2018, almost a third of Lithuanians were skeptical about the importance of children's vaccines. Soon after, Lithuania experienced a large measles outbreak, which improved attitudes toward vaccination again. This suggests that public attitudes may be a key factor shaping public health crises, and that public opinion tracking may help foresee disease outbreaks. The fluctuation of public opinion in the brief period between May 2018 and March 2019 also suggests that Lithuanians' attitudes toward vaccines can be volatile. While some researchers may attribute such cases of variance to errors of measurement, others argue they reveal more about the underlying nature of public opinion and how people think (Converse 1964).

A fourth significant finding is a considerable discrepancy between Lithuanians' views toward the importance of vaccines and their perceptions of effectiveness and safety. While Lithuanians' beliefs about vaccine importance are positive, their perceptions of effectiveness and safety are more cautious. Except for May 2018, public evaluations of vaccine safety ranged from 52% to 66.7%, meaning that at least every 3 out of 10 people had doubts about the safety of vaccination (Table 1). Perceptions of vaccine effectiveness were relatively similar: except for March 2019 perceptions of effectiveness ranged from 35.9% to 63.3%–67.0% (Table 1). This discrepancy may suggest that even those who understand the benefits of vaccines may be prone to delaying or refusing children's immunization. These findings also demonstrate that positive perceptions of vaccine importance may not guarantee high vaccination rates.

Overall, these findings have implications for public health interventions and communication about vaccines. First, they provide a clearer picture of vaccine perceptions in Lithuania, suggesting that Lithuanians may not be “anti-vaccine,” but hesitant about vaccination. In terms of public health literature, they could be called the “fence-sitters”—not entirely rejecting vaccines, but worried about their impact (Rossen et al. 2019; Betsch et al. 2015). Second, the findings have implications for public health politics and health communication: They suggest that different vaccines are perceived differently, requiring different communication strategies. For example, this overview has pinpointed specific vaccine-related concerns among Lithuanians, which could be used to target vaccine-related

communication toward public views. If public health messages in Lithuania focus on vaccine importance instead of evidence on their safety, for example, they may fail to address Lithuanians' core concerns. Future studies should explore and better tailor effective messaging and communication.

Finally, there is an implication for research politics: The amount of representative research on Lithuanians' attitudes toward vaccination is limited, and the existing studies use different methods and are hard to compare. Representative surveys using standardized instruments to measure the Lithuanian population's perceptions of vaccination, done regularly, would provide both an evidence base for pre-emptive public health measures and be a valuable tool for scholarly research.

Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest to disclose.

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