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COMMENTARY

Using the social structure of markets as a framework for analyzing vaccination debates: The case of emergency polio vaccination

Yaron Connelly[a], Arnona Ziv[a], Uri Goren[b], Orna Tal[a], Giora Kaplan[a], and Baruch Velan[a]

[a]The Gertner Institute for Epidemiology and Health Policy Research, Tel-Hashomer, Ramat Gan, Israel; [b]e-Pochondriac, digital health-consultancy, Zur Moshe, Israel

ABSTRACT

The framework of the social structure of markets was used to analyze an online debate revolving around an emergency poliovirus vaccination campaign in Israel. Examination of a representative sample of 200 discussions revealed the activity of three parties: authoritative agents promoting vaccinations, alternative agents promoting anti-vaccination, both representing sellers, and the impartial agents, representing the customers—the general public deliberating whether to comply with vaccination or not. Both sellers interacted with consumers using mechanisms of luring and convincing. The authoritative agents conveyed their message by exhibiting professionalism, building trust and offering to share information. The alternative agents spread doubts and evoked negative emotions of distrust and fear. Among themselves, the alternative agents strived to discredit the authoritative agents, while the latter preferred to ignore the former. Content analysis of discussions conducted by the general public reveal reiteration of the messages conveyed by the sellers, implying that the transaction of pro and anti-vaccination ideas indeed took place. We suggest that the framework of the market as a social structure can be applied to the analysis of other vaccination debates, and thereby provide additional insights into vaccination polemics.

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The analogy between vaccination debates and the social structure of markets

Vaccination is recognized as one of the greatest achievements of modern medicine. Nevertheless, the history of vaccination is marked by ongoing public debates and controversies, beginning with the introduction of the smallpox vaccination and continuing today.[1-2] The arenas hosting these debates have changed with time, discussions have moved from the town-square[1] to the courtroom,[3] and later to the mass media.[4] In recent years, the internet of the "Web 2.0" era has gained recognition as the major arena where vaccination debates take place,[5-6] establishing the Web as the new post-modern "town-square."

While the arenas hosting these discussions have changed with time, some common motives can be found in most vaccination debates. These include: evaluation of risk, expression of trust versus distrust, uncertainty, hesitancy and evaluation of available information related to infectious diseases and vaccines.[7-12] In addition, in most vaccination debates, one can identify three major players: the authoritative agency that promotes the pro-vaccination agenda, the alternative agency that promotes the anti-vaccination agenda, and the general public which is the target of the various vaccination campaigns. Both, the authoritative and alternative agencies invest efforts to communicate their message to the general public in order to encourage acceptance of their respective agendas. Thereby, vaccination debates resemble market scenarios, where the authoritative and the alternative agents act as sellers and the general public as buyers.

The understanding of the complexity of modern vaccination debates could gain from borrowing some of concepts formulated in the framework of the "market as a social structure."[13] In recent years, scholars have been using the sociological prism to study market interactions, allowing better examination of the tied and tangled networks of social interactions between market actors and examination of the theoretical constructs which characterize those interactions.

Some of the narratives and the main theoretical constructs of the sociological approach to markets can be easily identified in the vaccination discourse. ***Trust*** is argued to be one of the most prevalent constructs linking buyers and sellers in the market.[14] Close ties to others over long periods of time, enhance the credibility of transactions[15] and create information dependence.[13] Trust of the lay public in health authorities is also a major factor in compliance with vaccination campaigns[8,16,17]

Trust is strongly linked to ***uncertainty*** in the market structure, and is related to the difficulty in estimating the quality or value of the exchangeable commodities.[18] In the vaccination discourse, enhancing uncertainty is one of the major tools used by vaccination opponents to undermine the authority of the health establishment.[10,19]

Information appears to be another theoretical construct that emerges from market analyses.[13] Information is a valuable

CONTACT Baruch Velan baruch_v@yahoo.com; baruchv@gertner.health.gov.il The Gertner Institute for Epidemiology and Health Policy Research, Tel-Hashomer, Ramat Gan, 52621, Israel.

resource that market actors will try to acquire and exchange.[20-21] Information exchange is also a major tool in vaccination debates where complex medical information has to be communicated to the general public by authorities in a clear yet accurate way, and should compete with destructive information provided by the anti-vaccination groups.[10,22-23]

Taken together, all these analogies suggest that the modern vaccination debate is a complex three-party interaction displaying the dynamics and the narratives of social markets. This justifies a consolidated analysis of the behavior of the interacting actors, and the use of relevant motives in vaccination debates in the context of an interactive market environment.

The characteristic of the online debate related to an emergency polio vaccination program in Israel – Identification of sellers and buyers

An online vaccination debate related to a recent polio vaccination campaign in Israel appears to be an appropriate case study for analyzing the vaccination debate in the context of a social market. At the end of May 2013, the Israeli Ministry of Health (MOH) confirmed the reintroduction of the wild-type poliovirus 1 into Israel following its detection in the routine environmental surveillance of the sewage system. Enhanced clinical surveillance did not detect any cases of paralytic poliomyelitis, most likely due to the high coverage rate of the routine vaccination of all children with inactivated poliovirus vaccine (IPV). Nevertheless, in mid-August the MOH decided to re-vaccinate all children aged between 0 to 9 years, with the bivalent oral polio vaccine (OPV) in order to stop the spreading of wild type poliovirus.[24,25] The new polio vaccination campaign led to an animated public debate which took place in the formal media, as well as on the online platforms.

A Web search (outsourced to "Buzzila Ltd.") conducted using "polio" as query identified 32,500 polio-related discussions during the month of August 2013. The original database was reduced to a manageable representative sample of 200 discussions, in order to facilitate content analysis. This sample was set according to the proportional representation of discussions in the various online arenas in the original database.

Coding of the discussants was performed in order to classify the sources according the generators of the discussions. This was performed by identifying the designation of the website in which the discussion occurred, and by careful content evaluation aimed at identifying the drivers of the discussion. Six major generator groups were defined: 1) Health care professionals, 2) Anti-vaccination protagonists, 3) Alternative medicine practitioners 4) Authors of media articles and talkback responders, 5) Mothers and mothers-to-be 6) Individual persons. These were then further divided into 3 major categories: A) the authoritative agency (group 1), B) the alternative agency (groups 2, 3) and C) the non-partial agency (groups 4-6), which most probably reflected the genuine responses of a deliberating public. Altogether, 50 (25%) of the discussions were conducted under the umbrella of the authoritative agency, 57 (28.5%) under the alternative umbrella and 93 (46.5%) were defined as impartial, suggesting a well-proportioned distribution of sellers and buyers.

The characteristic of the online emergency polio vaccination debate – Identification of social constructs and interrelationships

The major motives manifested during the online debate were identified by content analysis of all 200 sample discussions. The analysis relayed on the main four criteria outlined as quality instruments in content analysis: Use of a theory-based instrument (the validity criterion), choice of specific content unit of analysis (the systematic consistency criterion), use of content that cannot be subjected to change, (the objectivity criterion), and performing an acceptable inter-coder test (the reliability criterion).[26,27]

Content analysis was conducted for each of the agency groups by examining separately the discussions generated by the authoritative agents, the alternative agents and the impartial agents. Delineation of the motives displayed in the discussions led by the two 'sellers' parties (authoritative and alternative) was used to identify mechanisms aimed at convincing people to vaccinate their children (in the case of the authoritative agents) or not to vaccinate them (in the case of the alternative agents). Delineation of the motives displayed in the discussions led by the 'buyers' (non-partial agents) was used to identify the reaction of the buyers to the efforts of the 'seller's.

Mechanisms used by the authoritative agency

The authoritative agents were found to lure potential clients by highlighting profound medical-professional expertise, which was displayed very early in the discussion. They invited clients to ask specific questions, and marketed their ability to provide professional answers and scientific information. The following examples represent invitations to participate as observed in discussions governed by authoritative agents:

1. "This site is intended to clarify these questions and other questions, with the assistance of pediatricians and infectious disease experts who will provide answers to everyone."
2. "This forum will provide answers to parents' questions related to vaccines for children, to the need for vaccinating children, side effects, timing of the vaccination, new vaccines and vaccination for traveler children."

The leveraging of the medical expertise, employed as a luring technique, was also displayed as the mechanism of convincing buyers. The medical professionals spurred their clients to get vaccinated by providing clear information and instructions related to vaccination. This mechanism was usually activated when responding to questions of undecided individuals. This is demonstrated in the following citations:

1. "This is precisely the age to receive the second dose of the quintuple vaccine that contains the second IPV vaccine, along with the OPV vaccine. There is no need to split OPV from the quintuple vaccine."
2. "A child vaccinated with the inactive vaccine can still be infected by wild type poliovirus, excrete the virus for a few weeks, and then the child might infect a relative, neighbor or unvaccinated baby. In light of this, I'll recommend that

the child receive the OPV, and this way he/she won't excrete poliovirus, even if he will be exposed to it."

A different kind of convincing mechanism, used by the authoritative agents, is related to the concern expressed by the public regarding vaccine safety and particularly, the risk of detrimental effects of the vaccine on health. In response, the experts tried to reassure the concerned information seekers, and neutralize the barriers arising from fear. Attempts were made to convince the public that the vaccine is safe and that potential risks are extremely low. The following examples demonstrate these efforts:

1. "Because your child has already received inactivated polio vaccine, there is no danger from vaccinating him with OPV."
2. "Your baby received IPV and thus the risks from OPV are extremely low."

Mechanisms used by the alternative agency

The alternative agents tried to promote an anti-vaccination agenda, and the first step in luring the already confused and doubtful 'client' was to further undermine the confidence in the vaccine. The headings or the first sentences of all the discussions managed by alternative agents, contained expressions of doubt or skepticism related to the vaccine. This is represented in the following examples:

1. "We will respond to your questions and explain the consequences of the polio vaccination and why the vaccine is so controversial"
2. "The Polio campaign - 14 Reasons why you should think twice before vaccination."

Once the potential client has been lured, the alternative agents tried to generate discussions revolving around the faults of the vaccine, using emotions to promote rage about the aims of the vaccination program, underlining its dangers and attributing to the authorities malicious intentions.

1. "Are you going to introduce suspicious substances into the body of your child? Are you a responsible parent? So stop whining, don't allow someone to decide for you. Take responsibility and say 'No,' loud and clear: 'No'!"
2. "Do you want to explode from rage? Really explode? - The vaccine that they are pushing has never been tested. I repeat: not tested. No clinical trial has been conducted. No trial. Your children are the trial!"

Communicating fear is one of the major tools used by vaccine antagonists, describing the vaccine as dangerous and warning against potential dangerous ramifications. The following quotes demonstrate several examples of the efforts to persuade by the use of fear:

1. "Apparently, the OPV caused at least 800 cases of narcolepsy in Europe, and at least one case here in Israel. Narcolepsy is a severe chronic disease that causes frequent excessive daytime sleepiness and many other serious problems"
2. "The entire world has stopped using the OPV because of the problems of serious side effects, paralysis and death"
3. "There was an interview with a doctor from India, a polio expert, who found that as more OPV vaccines were given in India, the incidence of paralysis became higher."

While the authoritative agents focused their statements mostly on the product itself and refrain from referring to the opponent agency, practically ignoring it, the alternative agents often integrated in their discussion negative attributions to the authoritative agency

1. "It appears that the left hand doesn't know what the right hand is doing in the Ministry of Health. To remind you, this is the same vaccine that the Director General of the Ministry of Health now describes in terms of "zero risk," but in 2007 the ministry representative said that it was dangerous to use and had not been approved in developed countries. Apparently, we are not a developed country after all."
2. "Once again, the Ministry of Health is going to spend millions of dollars on vaccines in vain. Only this time, the danger is that the vaccine will cause the disease."

The public response to both agencies

The public didn't remain indifferent to the marketing efforts of the two rivals, as manifested by numerous deliberations about the OPV at several online arenas: forums, articles, comments, blogs, social networks, etc. The content analysis of these apparently non-partial discussants revealed four motives reflecting the publics' reactions to the sellers' agenda: Acceptance or negation of the authoritative agenda, and acceptance or negation of the alternative agenda.

Acceptance of the authoritative agenda:

1. "The OPV was the routine vaccine used by authorities in Israel until 2004. A lot of children have received it for years."
2. "I think that in the current situation, where there is no real risk for those children vaccinated with the OPV after they had received the IPV, we all need to lend a hand (and in this case a tongue) and vaccinate."

Negation of the authoritative agenda and distrust:

1. "I've heard too many stories about personal interests that lead health systems to take bizarre decisions."
2. "I don't trust the Ministry of Health, or any other governmental agency, I don't believe that the senior official would prefer the public interest over their own interest."

Acceptance of the alternative agenda:

1. "We have overwhelming opposition in our community, and I'm sure most of us will never vaccinate our children."
2. "I do not want to be a guinea pig; a lot of information about this vaccine is still missing. Is it really useful??? Why hide so much of information about it?"

Negation of the alternative agenda:

1. "I read the comments of the anti-vaccination association, who filed the petition against the vaccine. They have no proper qualifications. In the past they advocated against the quintuple vaccine in their website. Therefore, their resistance to the vaccine is probably not just an anecdotal event but rather ideological."
2. "We should remove the source of danger, and at the moment, the anti-vaccination protagonists are a source of danger."

An additional motive that should not be overlooked reflects the attitude of the undecided 'client'. The one still hesitating on whether to vaccinate or not

1. "My children are protected, but the thought that they may infect infants or other children who cannot be vaccinated is stressful. Moreover, there is the tiny risk that the vaccine can cause them to get sick Yes it's also stressful to read that the virus spreads through the sewage system. Nevertheless, if you are careful about your hygiene; the risk of infection is reduced. Indeed, it's a very difficult question."
2. "I still cannot figure out what to do: if my children are already vaccinated, why should I vaccinate them again?"
3. "So far, my children have been vaccinated with all the vaccinations, but in relation to the OPV case, I really do not know what to do."

Applying the social framework of market for analysis of vaccination debates

The framework of the market as a social structure, proposed here, has been borrowed from the wider sociological approach to markets, and has the potential to provide additional insight into the vaccination debate. Applying the sociological market approach to a concrete vaccination debate centered on an emergency polio vaccination campaign allowed us to reveal an intricate structure of interaction depicted in Figure 1. The framework of the vaccination market structure in our case study is defined by a network of interaction between 3 major players (depicted in bold boxes in Fig. 1). Two of the players act as sellers (the authoritative and the alternative agency) and the third player was identified as the group of consumers, trying to make a vaccine-related decision.

A complex set of interactions was identified (marked by arrows in Fig. 1). The interactions between the 2 "selling" agencies appear to be non-symmetrical. The alternative agents dedicated efforts to discredit the authoritative agenda, while the authoritative agents did not relate to the competing messages of the alternative agency. This could reflect a situation where the alternative party feels threatened by the authoritative party, while the authoritative party feels secure enough to ignore the opponent.

The interaction of sellers with the potential buyers could be framed as luring and convincing. The first is used to draw the buyer's attention to the sellers' message, and the second to convince them that the message is worth acquiring. Interestingly, both sellers, the authoritative agency as well as the alternative agency were found to exhibit this pattern of communication in the interaction with the general public.

Examination of the discussions led by the potential buyers among themselves suggests that the messages of both the alternative and authoritative agencies have indeed reached their targets: The pro-vaccination as well as the anti-vaccination arguments were reflected in the discourse of the general public. This was accompanied by an additional form of response: Some discussants were not able to make up their mind, after being exposed to the arguments of both sellers. This observation echoes a newly defined trend, termed vaccine-hesitancy, which characterizes the response of many parents faced with the requirements to vaccinate their children.[12,28-29]

The online content analysis also led to the identification of the mechanisms used by both selling parties to convey their messages (depicted in italics in Fig. 1). The interactions between the parties in the polio vaccination online debate are characterized by four mechanisms: building trust, supplying information, disseminating uncertainty and evoking negative sentiments. The first two are used by the authoritative agency and the last two by the alternative agency. Interestingly, the two agencies rarely use the opponents' techniques. The authoritative agents rarely resorted to emotional or fear-mongering messages, whereas the alternatively agents did not try to provide rational, quasi evidence-based arguments.

It should be noted that the various forms of interactions and agency-specific strategies identified in our study should not be regarded as generic in nature. Indeed some reversal of strategies

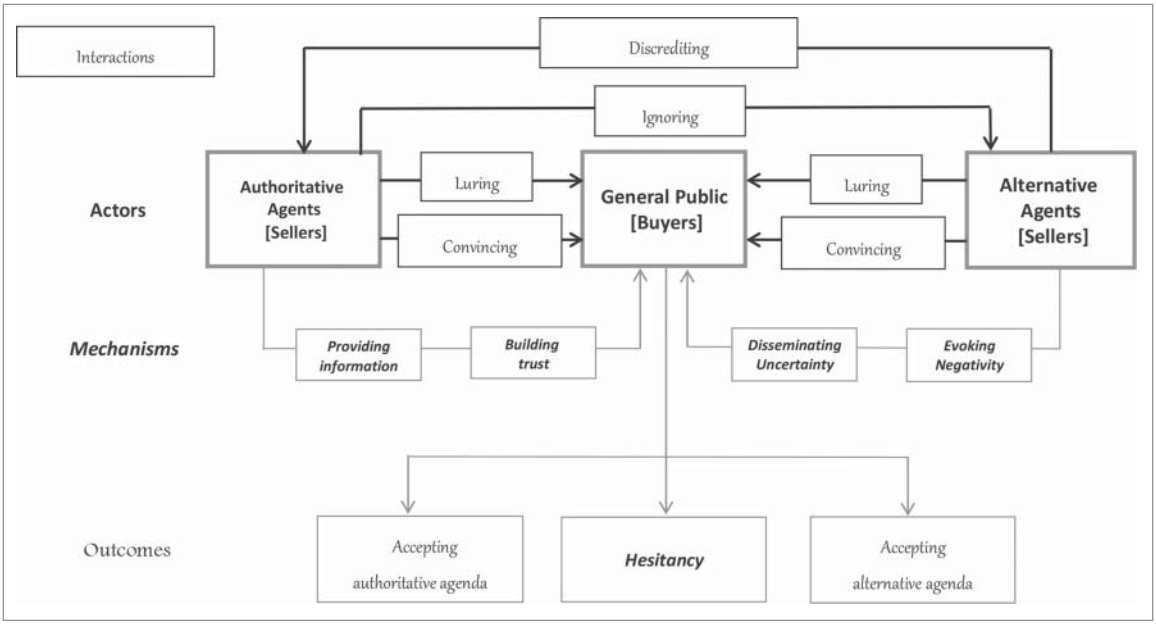

Figure 1. Scheme of the polio vaccination debate modeled as a social structure of market.

was observed during the debate related to the H1N1 influenza campaign of 2009. In this case pro-vaccinators resorted to emotional strategies by underlying the immense potential danger of the epidemic, evoking the worldwide disaster related to the 1918 Spanish flu.[30] Vaccination protagonists related to quite rational arguments stressing that the safety tests of the H1N1 vaccines were not thorough enough,[31] and the use of new adjuvants in these vaccines could be questionable.[32]

In summary, our study suggests that applying the framework of the market as a social structure to the analysis of the vaccination debate is relevant and can provide additional insights. We recommend applying this approach to the examination of other vaccination debates and suggest using a stepwise strategy: a) Characterization of all players and identification of the sellers and the buyers. b) Identification of the forms of interactions between the various players, c) Delineation of the mechanisms used by the sellers as motivators/enhancers to promote their agendas, d) Identification of the response of the target population (the buyers) to the sellers' efforts. We believe that this approach could also be relevant to other health-related debates and could yield an effective tool for decision makers in developing vaccine promotion tools.

Disclosure of potential conflicts of interest

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