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The influence of communicating a vaccine-related adverse event (Vre) on the propensity to get vaccinated. The case of Camilla Canepa's death in Italy

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Abstract

The aim of this paper is to investigate the influence of communication of vaccine-related event on individuals' propensity to get vaccinated. Applying the methodology of the event study, the case of the news of the death of Camilla Canepa, a young Italian girl, was considered as an adverse event related to the COVID-19 vaccine in the analysis conducted. The results show that, despite the availability of vaccine doses, an increasing trend of vaccine administration was observed in the pre-death news period and a decreasing trend in the post-death news period.

Keywords – Health communication; Vaccine-related event; Event study

Paper type – Academic Research Paper

Sommario

Lo scopo del presente studio è quello di analizzare gli effetti della comunicazione di un evento correlato alla somministrazione di vaccino sulla propensione degli individui a farsi vaccinare. La metodologia dell'event study viene applicata al caso della notizia del decesso di Camilla Canepa, una giovane ragazza italiana, considerato come evento avverso correlato al vaccino contro il COVID-19. I risultati mostrano che, nonostante la disponibilità di dosi di vaccino, vi sia stata una tendenza crescente della curva della somministrazione del vaccino, nel periodo antecedente alla notizia del decesso, e una tendenza decrescente, nel periodo successivo alla notizia del decesso.

Parole chiave – Comunicazione sanitaria; Evento correlato al vaccino; Event study

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1 Introduction

The current paper aims to investigate the influence of scientific communication on individuals' choices in the field of health. In particular, it analyzed the effects that a particular news could have on the decision to undergo the anti-COVID-19 vaccination. In the specific case, the news of the death of the eighteen-year-old Italian Camilla Canepa, which took place on June 10, 2021, following a cerebral thrombosis that occurred some after receiving the AstraZeneca vaccine, was chosen as an "event" in the analysis.

Considering the study's aim, the event study methodology was applied. Traditionally, this scientific method is used to evaluate the effects of a particular event on the share price trend of listed companies, i.e. to consider the measure of the average change in the share price that occurs following the announcement of an important "event" (Binder, 1998). Event studies have been used extensively in the fields of accounting, economics, and finance to evaluate the effect on the stock price of a major company announcement (MacKinlay, 1997; Thompson, 1995). More recently, organizational researchers applied this methodology also in research focused on the study of managerial decisions, such as changes in corporate governance and on decisions involving corporate social responsibility (CSR) (Murashima, 2020; Qiu et al., 2021).

From literature review, emerged that several contributions applied the event study methodology to analyze the effects of certain events concerning the COVID-19 pandemic. Sayed and Eledum (2021) studied the short-term response of the Saudi stock market to the COVID-19 outbreak, in this case, the event study methodology was applied to calculate abnormal returns for trading days following the announcement of COVID-19 in both China and Saudi Arabia. In another contribution, the event study method is employed with the aim of verifying the impact of the COVID-19 pandemic on the equity returns of a sample of listed companies in the energy sector operating in Greece, the event study approach made it possible to demonstrate that the pandemic has affected the returns of most listed energy companies (Polemis & Soursou, 2020). In their study, Maneenop and Kotcharin (2020) examine the short-term impact of the outbreak on the global airline industry using event study methodology to determine the effects on airline stock returns following three major announcements from the World Health Organization regarding the spread of COVID-19. In another research, some scholars have applied event analysis to determine the possible effects of events related to the protests for the "George Floyd case" and the increase in COVID-19 infections (Valentine, R. et al., 2020).

Researches applying event study method to determine correlations between events concerning adverse reactions to the anti-COVID vaccine and the propensity of individuals to receive this vaccine belong to a further line of research. In one of the studies from this strand, David Comerford (2021) examined, in an event analysis, the effects of the decision of the UK regulatory authority not to

administer the Oxford AstraZeneca vaccine to people under 30, proposing a vaccine alternative. The decision became front page news, and online searches questioning vaccine safety increased exponentially; in this case, the study of the event dealt with examining the effects of the news on the attitudes of the British with respect to the anti-COVID-19 vaccine. Analysis of data collected the day after the story hit the front page showed no change in intentions or attitudes in the sample as a whole, nor in the subgroups considered most affected by guidance from UK regulators (people under 30 and people between the ages of 30 and 40).

The present paper fits into this last line of research, the research objective being the analysis of the influence of scientific communication on the choices of individuals in matters of health, considering the influence of a particular piece of news concerning adverse events attributable to the anti-COVID-19 vaccine on the decision to undergo this vaccination. The interest is therefore to study the distribution of the number of vaccinations performed on a given day before and after the particular event considered, i.e. the death of the eighteen-year-old Italian Camilla Canepa, which occurred on 10 June 2021, following a cerebral thrombosis which occurred some after receiving the AstraZeneca vaccine.

2 Background

2.1 Vaccines: the role of health communication

Especially when it comes to health, communication must be used wisely, with the right tones, the appropriate means, and particular attention to the target it is addressed to and the purpose it wants to achieve. A very interesting definition of health communication is the one proposed by the communication expert Renata Schiavo (2013, p. 8): “Health communication is a multifaceted and multidisciplinary approach to reach different audiences and share health-related information with the goal of influencing, engaging, and supporting individuals, communities, health professionals, special groups, policymakers and the public to champion, introduce, adopt, or sustain a behavior, practice, or policy that will ultimately improve health outcomes”.

In the COVID-19 pandemic, certain aspects of communication have also contributed significantly to polarizing the debate on the origin and nature of the virus and then on vaccines. Starting with one of the most important: the language used by experts and journalists. Using war metaphors and terms from the military lexicon, for example, did nothing but exacerbate the feeling of rejection that many have had and force even further the delicate balance between public health protection and respect for individual freedoms. In an article published in *Nature Italy*, Massimiano Bucchi (2021) focused on the importance

of mutual trust between citizens and institutions, during the COVID-19 pandemic, highlighting that, in many countries, including Italy, politicians and experts described public opinion as hostile, skeptical and ignorant. The author argued for the need for clear and open communication by the institutions, which nurtures and strengthens responsible behaviours by citizens, instead of accentuating distrust and paternalism.

Communication regarding vaccines, in Italy as in the rest of the world, has always been a minefield, in which every misstep can cause a real “social explosion”. It is important to correctly manage communication on such an important topic in general, and so urgent in particular (Stockwell & Fiks, 2013; Lewandowsky et al., 2021; Schiavo, 2020; Rzymiski et al., 2021). To this end, it is also necessary to understand the doubts and fears of those who are not against vaccines a priori, and to listen to the motivations of those who, on the other hand, reject them a priori (Chou & Budenz, 2020; Tsai et al., 2021; Wei et al., 2022; Kim et al., 2022). Walking on this thin line without losing balance and without losing sight of the objective of safeguarding public health is not an easy undertaking, but it is certainly a skill that those involved in communication currently cannot fail to acquire (Gabarda & Butterworth, 2021; Breckenridge et al., 2022; Murphy, 2020).

2.2 Communicating vaccine-related events (Vre)

In the present study, the definition of vaccine-related event (Vre) reported is that by World Health Organization (WHO), according to which Vre is an “event related to vaccines that can negatively affect a vaccination programme” (WHO, 2013, p. 11). WHO, in the guide *Vaccine Safety Events: managing the communication response*, reported six types of Vre: “i) adverse event following immunization (AEFI); ii) a new study or experimental data related to vaccines or immunization; iii) a report in the press, or a local rumor about vaccines; iv) the temporary suspension of a vaccine; v) vaccine recall; vi) the replacement of a vaccine” (WHO, 2013, p. 12). The guide not only describes the most frequent types of Vre but also provides strategies and tools for solving communication problems related to vaccine safety. The collection of this information is necessary to classify Vre, which according to the WHO guide can have three levels of impact: low, medium, high, each of which provides for a different communication scenario (WHO, 2013).

Considering the large amount of information necessary to manage similar events in the best possible way, it is advisable to “organize communication as much as possible ‘in peacetime’, planning response activities, identifying contacts who can act as institutional spokespersons, defining the practical aspects of communicative response, response methods and timing, communication channels, etc.” (Fiacchini et al., 2018, p. 98). On this topic, several contributions have been provided in the literature. Renn and

Levine (1991) focused on credibility and trust as key factors for effective risk communication. Wang et al. (2020) described the risk perception and behavioral responses associated with risk communication, Hagen et al. (2020) instead considered the role of social media in promoting an effective communication efforts under crisis conditions. Furthermore, Dubé et al. (2020) focused on optimizing the communication material, while Zheng et al. (2022) also focused on the doctor-patient communication relationship.

3 Methodology

3.1 Data gathering

The current study was aimed at investigate the influence of scientific communication on individuals' choices in the field of health. By applying the Event Study methodology (Austin, 1993), the effects that a particular piece of news could have on the decision to undergo anti-COVID-19 vaccination were analysed. The news chosen as an “event” in the present analysis is that of the death of the eighteen-year-old Italian Camilla Canepa, which took place on June 10, 2021, following a cerebral thrombosis that occurred some after receiving the AstraZeneca vaccine.

Data used to conduct this analysis was gathered from two main sources:

- with reference to the daily number of vaccine administrations available in Italy, the data was found online, on the official website of the newspaper *Il Sole24ore* (Il Sole24Ore website);
- with reference to the number of vaccines made available to the various regional ASLs, the data was found online, on the GitHub.com website (GitHub website).

4. Data analysis and statistical analysis results

4.1 Descriptive analysis

From the descriptive analysis (see Table 1), emerges that in the post-news case we find one more observation that corresponds to the day of the event. The descriptive analysis reveals that the administrations are on average and median more numerous following the news. The first approach is to run a test to check whether the distribution of the variable in the two times is different or not. The nonparametric Mann-Whitney test is used because the condition of normality of the data is not satisfied. The use of a non-parametric test, in fact, allows not to make assumptions on the parameters of the population as long as three conditions are met:

- at least ordinal dependent variable;
- only two groups;
- independence between observations.

It is immediate to verify that in the case under analysis they are all satisfied.

Table 1 - Descriptive analysis

Administrations			
0	N.	Valid	61
		Missing	0
	Average		450855.92
	Median		465062.00
	Mod.		202488 ^a
	Std. Dev.		102114.945
	Min		202488
	Max		632924
	Percentiles	25	377544.00
		50	465062.00
		75	529126.50
1	N.	Valid	62
		Missing	0
	Average		523183.26
	Median		557160.00
	Mod.		259727 ^a
	Sdt. Dev.		83309.107
	Min.		259727
	Max		633995
	Percentiles	25	467072.00
		50	557160.00
		75	573523.50

a. There are more modes. The smallest value is displayed.

Source: our elaboration

4.2 Hypothesis test

In the behavioral science field, the Mann-Whitney U test is one of the most commonly used non-parametric statistical tests (Nachar, 2008), being frequently applied to compare localization measures for two samples where the assumption of normality is complicated (Rosner & Grove, 1999). The Mann-Whitney test has the null hypothesis that the distribution of the number of administrations is the same before and after the occurrence of the event; the empirical evidence represented by an extremely small p-value contradicts this hypothesis. It should be specified that the test, based on the

data, states that the number of vaccinations is different between the pre and post news but not that this is exclusively due to knowledge of it. The analysis is based on the data available but many variables are missing in order to have a complete picture of the factors that influence the administrations on a given day. Having ascertained that the two distributions are significantly different, we proceed with a multiple linear regression. The dependent variable Y is the number of administrations and the independent variables are X_1 : the day, X_2 : whether we are in the pre-news ($X_2 = 0$) or in the post ($X_2 = 1$) and the interaction between the two variables $X_3 = X_1 * X_2$. The latter is inserted to observe a joint effect between the event and the day of administration, it is different from 0 if and only if X_2 is also different (Table 2).

Table 2 - Hypothesis test

Hypothesis test recap				
	Hypothesis null	Test	Sign. ^{a,b}	Decision
1	Distribution of administrations is the same on pre-post categories	Mann-Whitney U test with independent samples	<.001	Reject the null hypothesis

a. The significance level is .050.

b. The asymptotic significance is displayed.

Source: our elaboration

4.3 The model

The R^2 coefficient, the percentage of variability of the dependent variable explained by the model, is on the borderline between low and modest. We note that all independent variables are statistically significant (Sign. <.001).

The model is: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 * X_2$.

In the period preceding the event (i.e. when X_2 is equal to 0) the regression line will be $Y = \beta_0 + \beta_1 X_1$. The intercept is the number of vaccine administrations we expect on day 0, approximately 310243 administrations. The coefficient of the day variable tells us that for each additional day we expect an average increase of about 4546 administrations in the period before the event.

In the scenario of the occurred event, the straight line becomes: $Y = \beta_0 + \beta_1 X_1 + \beta_2 + \beta_3 X_1 = \beta_0 + \beta_2 + (\beta_1 + \beta_3) X_1 = 743003.575 - 2376.436 * X_1$.

As emerged from the descriptive analysis, we expect a higher average in administrations on day 0 of the post-news scenario. It is interesting to note that in the post-event period, as the days go by, there is a

decrease in the number of administrations, specifically, for each day that passes, there is a decrease of approximately 2377 vaccinations (Table 3, Table 4).

Table 3 - The model^a

Model	R	R-squared	R-squared adapted	Standard error of estimation
1	.740 ^b	.547	.536	67849.137

a. Dependent variable: vaccine administration.

b. Predictors: (constant), interaction, time, pre-post (0=pre news of the death, 1=post news of the death).

Source: our elaboration

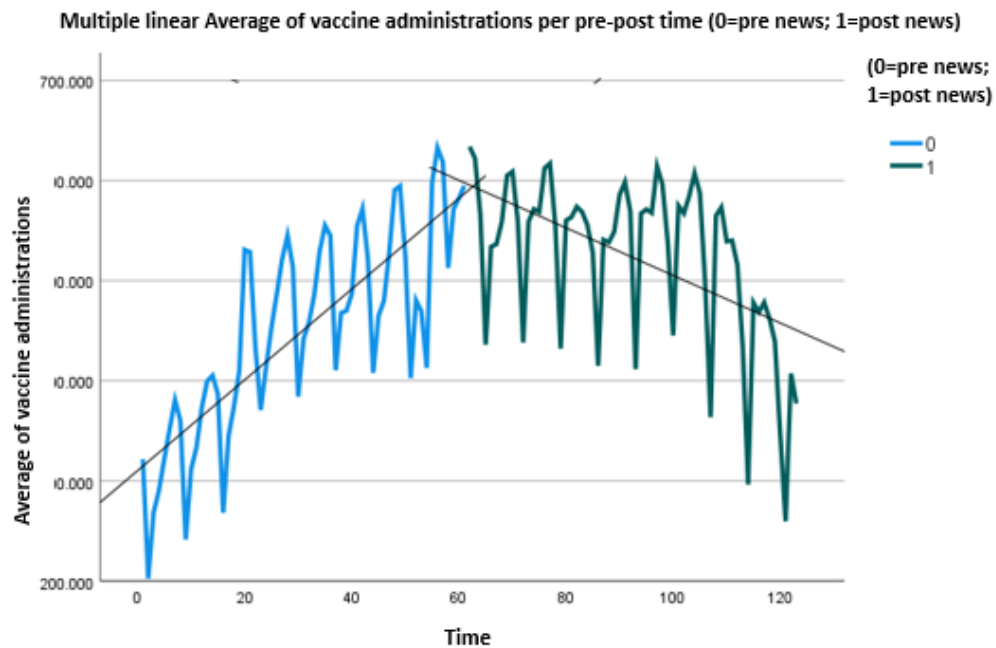
Table 4 - Coefficients^a

Model	Non-standardized coefficients		Standardized coefficients	t	Sign.
	β	Standard error	β		
1 (Constant)	310242.866	17590.223		17.637	<.001
Pre-post (0= pre news, 1=post news)	432760.709	48656.304	2.182	8.894	<.001
Time	4535.905	493.399	1.624	9.193	<.001
Interaction	-6912.341	689.415	-3.343	-10.026	<.001

a. Dependent variable: vaccine administration.

Source: our elaboration

Finally, the graph of the trend of the number of vaccinations administered in the days under analysis is shown, in Figure 1, with the related interpolation lines. We note what emerged from the multiple linear regression, an increasing trend of administrations in the pre-news period and a decreasing trend in the post-news period.

Figure 1 - Trend of vaccinations (pre-post event)

Source: our elaboration

5 Conclusions

The decision to undergo vaccination, like any other decision concerning health, is likely to be influenced by the risks and benefits perceived by each individual at the time of the choice. Factors that can influence the choice to get vaccinated are various, in quality and quantity. They can derive from the perception of the benefits that the vaccine would bring to public health, or, as more often happens, from that of the risks that the vaccine would bring to individual health. In the case of the COVID-19 vaccines, many circumstances that occurred before their discovery contributed to creating hostility, starting with doubts about the artificial nature of the virus and above all with suspicions about the possible “leakage” from the Chinese laboratory. The relief with which the anti COVID-19 vaccines were received in Italy, seen as the end of the nightmare of quarantines and restrictions, was soon replaced by more or less reasonable doubts about the nature and consequences of immunization. The phenomenon of vaccine hesitancy has been discussed, noting that most people are more timidly hesitant than stubbornly wary of vaccines. Both undecided and against would have a chance to make a conscious choice so delicate and so full of consequences for everyone’s health: true information adequately

communicated. During the current pandemic, many factors of weakness have emerged in scientific communication regarding the new coronavirus and its vaccines, such as the arrogance not to admit uncertainty, lack of empathy and the choice of a language that makes us feel at war. Or rather, under siege.

In terms of vaccines, it is particularly important to adequately manage the communication of a related vaccine event, especially when it is an adverse event. Just as adverse reactions and deaths can negatively affect people's propensity to get vaccinated, so a music icon who gets vaccinated on live television can be instrumental in transforming the indecision of millions of people into confidence. If an adverse case occurs in the midst of a vaccination campaign, it is very probable that those who were previously against the vaccine are even more convinced that they have made the right choice by not getting vaccinated, but it is certain that those who were previously undecided will have one more element, and very heavy, to add to its list of cons. A particularly delicate Italian Vre was the death of Camilla Canepa, an 18-year-old girl who had participated in an Astrazeneca open day two days before her death, caused by a cerebral thrombosis attributable to the vaccine. In consideration of the power of news to directly or indirectly influence individual behaviors and choices, the news of Camilla Canepa's death was taken as a reference for an event study, to determine the existence or otherwise of a decrease in the number of vaccinated after this news broke. With the awareness of the impossibility of taking into account all the variables that could have caused a change in the number of vaccinations carried out (first of all the slowdown phase of the vaccination campaign due to the approach of summer), a comparison was made between the number of vaccinated 60 days before and 60 days after the eighteen-year-old's death. Taking into account the daily availability of vaccine doses, an increasing trend of vaccine administration was observed in the pre-news period and a decreasing trend in the post-news period.

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