Psychiatry Research 246 (2016) 581–586

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

A Google-based approach for monitoring suicide risk

Paola Solano[a,*], Morena Ustulin[b], Enrico Pizzorno[c], Monica Vichi[d], Maurizio Pompili[e], Gianluca Serafini[a,*], Mario Amore[a]

[a] Department of Neuroscience, Rehabilitation, Ophthalmology, Genetics, Maternal and Child Health (DINOGMI), Section of Psychiatry, University of Genoa, Genoa, Italy
[b] Department of Medicine, Graduate School, Kyung Hee University, Seoul, Republic of Korea
[c] Department of Health Sciences, Section of Legal Medicine, University of Genoa, Genoa, Italy
[d] Centre for Epidemiology, Surveillance and Health Promotion (CNESPS), National Institute of Health (ISS), Rome, Italy
[e] Department of Neurosciences, Mental Health and Sensory Function, Suicide Prevention Center, Sant'Andrea Hospital, Sapienza University of Rome, Rome, Italy

ARTICLE INFO

Keywords:
Suicidal behaviour
Online search-volumes
Suicide risk
Suicide prevention
Google

ABSTRACT

People seeking information and news regarding suicide are likely to use the Internet. However, evidence of the relationship between suicide-related search volumes and national suicide-rates in different countries can be strikingly different. We aimed to investigate the relationship between suicide-rates and Google suicide-related search volumes in the Italian population (2008–2012) using the Italian mortality database that provided monthly national data concerning suicides (2008–2012). Moreover, this study aimed to identify future trends of national suicide rates on the basis of the results we obtained concerning the period 2013-14. Google Trends provided data of online monthly search-volumes of the term "suicide", "commit suicide" and "how to commit suicide" in Google Search and Google News (2008–2014). Google Search volumes for the term "suicide" lags suicide by three months (ρ=0.482, p-value < 0.001), whereas no correlation was found between search volumes for "commit suicide" and "how to commit suicide" and national suicide rates. Google News search volumes for the three terms resulted in white noise. Apparently, online searches for suicide-related terms in Italy are more likely to be linked to factors other than suicidiality such as personal interest and suicide bereavement.

1. Introduction

Suicide prevention is a complex, global and mandatory task. Despite the large body of literature produced in the last century shedding light on this phenomenon, suicidal behaviour remains substantially unpredictable. Effective prevention strategies are difficult to develop because of their multi-dimensional nature (Maris, 2002) and the World Health Organization (2014) estimates that suicide represents 1.5% of all deaths with 800.000 deaths every year, i.e. one suicide every 40 s with evidence also suggesting the existence of an underreported association between single car accidents and suicide (Pompili et al., 2012). Despite the recent decrease in world suicide rates and the development of action plans aiming at reducing them of at least 10% by 2020 (WHO, 2014), these figures underline the need to develop comprehensive prevention strategies able to reach the general population.

The increasing widespread use of the Internet makes it one of the main information sources and official data showed that one third of the general population worldwide uses the Internet as a main source of information (International Telecommunication Union, 2011). In Italy, 56% of the population accesses the Internet at least once a week and 73% of households accessed the Internet in 2014 (Eurostat, 2015). Nowadays, mental health information is often looked for on the Internet by individuals who may perceive it as less stigmatizing and more confidential than seeking help from mental health professionals (Powell and Clarke, 2006). Even worse, suicidal individuals may not seek medical/psychiatric attention, but visit "pro-suicide sites" (i.e. websites providing a guide to suicide) (Harris et al., 2009), and, more rarely, prevention websites (Kemp and Collings, 2011). However, evidence gathered from people who survived nearly lethal suicide attempts showed that 36% of the attempters chose the suicidal method online by consulting mainly non "pro-suicide sites" (Biddle et al., 2012). Subjects with suicidal thoughts may be more likely to use wide searches looking for professional drug information and general knowledge sites apart from specific suicide sites (Wong et al., 2013; Biddle et al., 2012). Similarly, evidence demonstrated that the majority of

* Correspondence to: Department of Neuroscience, Rehabilitation, Ophthalmology, Genetics, Maternal and Child Health (DINOGMI), Section of Psychiatry, University of Genoa, IRCCS San Martino, Largo Rosanna Benzi 10, 16100 Genoa, Italy.
E-mail addresses: paola.solano@alice.it (P. Solano), gianluca.serafini@unige.it (G. Serafini).

http://dx.doi.org/10.1016/j.psychres.2016.10.030
Received 2 February 2016; Received in revised form 4 October 2016; Accepted 17 October 2016
Available online 20 October 2016

search engine users in the USA did not access "pro-suicide sites" using suicide-related queries, but through violent or bloody pictures that were apparently less related to suicidal intent than other suicide method information (Wong et al., 2013). However, people experiencing suicidal thoughts may also use the Internet to post a variety of comments on their feelings in both suicide specific and non-suicide specific websites (Dodemaide and Crisp, 2013) and forums dedicated to suicide which have developed worldwide (Mok et al., 2015). Evidence showed a significant decrease in suicidal ideation and thoughts among users of dedicated forums moderated by professionals as they allow free discussion of suicide-related issues (Sueki, 2013; Sueki and Eichenberg, 2012), although Sueki et al. (2014) found that disclosing suicidal feelings to anonymous others on the Internet resulted in an increase in suicidal ideation 7 weeks later.

There is growing interest about the possibility of linking national suicide-rates and Internet search volumes for suicide-related terms applying the principles of infodemiology and infoveillance to suicidology (McCarthy, 2010). For instance, epidemiologists monitor the use of Internet search engines to track epidemics, inferring their movements through changes in the search of terms related to particular pathogens. Similarly, recent studies on suicidal behaviours investigated the relationship between Internet search volumes of suicide-related terms and national suicide rates as a tool for monitoring suicidal behaviour in the general population. However, the studies applying this research method reported contrasting evidence about the reliability of this association in different countries (Gunn and Lester, 2013; Yang et al.,. 2011; McCarthy, 2010).

Moreover, the Internet is a potent tool for spreading news and is increasingly used by the media to reach the larger population (International Telecommunication Union, 2011). This is also demonstrated by the fact that suicide-related articles are often reported in online newspapers and blogs. Evidence suggested a five-fold increase in suicides following media reports of suicide which, however, is considerably smaller when compared to that of other risk factors. Thus, the link between online suicide-related search volumes in news specialized search engines and suicide rates should be investigated more thoroughly. The risk is supposed to depend not only on the readers' characteristics (Stack, 2005, 1992), but even on media content (World Health Organization, 2014). Therefore, in order to promote safe media content, the World Health Organization (2014) and national agencies developed guidelines for the reporting of suicides.

However, to the best of our knowledge, no study concerning the relationship between online suicide-related search volumes and Italian suicide rates has been carried out to date. Applying a methodology which is comparable to that used in other existing studies investigating this relationship in other countries, this cross-sectional study investigates the correlation between Google Search and Google News search volumes for the words "suicide", "to commit suicide" and "how to commit suicide" with national suicide rates in Italy (2008–2012). Moreover, since official monthly Italian suicide data concerning the period 2013–2014 have not been released yet, we also aimed to predict Italian trends of suicide-rates for those years according to the eventual relationship between suicide-related search volumes and suicide-rates in Italy during the previous four years (2008–2012). Furthermore, in order to adopt a methodology which is comparable to that used in similar studies in current literature (Bruckner et al., 2014; Gunn III and Lester, 2013; Sueki, 2011; Page et al., 2011; Yang et al., 2011), we investigated the mentioned relationships over the whole population without focusing on specific age groups of individuals.

2. Materials and methods

2.1. Sample

Mortality data were extracted from the Italian Mortality Database maintained by the Italian National Census Bureau (ISTAT) and processed by the Unit of Statistics of the Italian National Institute of Health pertaining to the years 2008–2012. The ISTAT collects all death certificates of Italian citizens who die in Italy, and codes the initial causes of death according to the International Classification of Diseases (for suicide the initial causes of death are coded under External Causes, labelled X60-X84;Y87.0).

All data pertaining to suicide deaths in Italy are mandatorily reported to the ISTAT which gathers data from emergency department reports, interviews with key informants that are carried out whenever the medical examiner or pathologist suspects suicide or any other submitted report regarding a completed suicide. These interviews are generally aimed at ascertaining the circumstances of the suicide and collecting information regarding the time of the act, the method used and the hypothesized reason for it. However, ethical sensitivity restricts what can be collected and a medical legal examination is not routinely performed except in cases open to debate when a judicial autopsy can be ordered by a Public Prosecutor. These data are entered into the ISTAT after certification and cataloguing by the state or military police. The study time-frame is from 2008 to 2012 in order to match the latest available register-based national suicide data with the available search trend data also because official national mortality data concerning suicide during the years 2013–2014 are not yet available. Only subjects aged ≥15 years have been included in the sample, while suicides completed by younger people (39 individuals in the considered time-frame) were not considered for confidentiality reasons.

Data regarding online searches of the terms "suicide", "to commit suicide" and "how to commit suicide" from January 2008 to December 2012 were retrieved in the Italian version of Google Trends (Google Trends, 2015), an online log of Internet search volumes. Google Trends (merged with Google Insights) offers a search of trends in Google over time in generic and different search services that were provided by Google. Importantly, Google Trends eliminates repeated queries from a certain user over a short period of time. Moreover, recent evidence supported the high predictive value of Google Trends that has been widely recognized to be a useful tool for public health policies and surveillance (Fond et al., 2015, 2014; European Centre for Disease Prevention and Control (ECDC)-Health Communication Unit, 2009). Google Search is the most-used search engine on the World Wide Web handling more than three billion searches each day (Alexa, 2015). Entered terms or phrases are commonly searched in different areas and topics so that users can use it for different purposes, while Google News is a free service provided by Google Search covering news and articles appearing within the past 30 days on various news websites and aggregates content from more than 25.000 publishers. Thus, users who are interested in suicide-related news are more likely to search them through this application than Google Search: therefore, the two groups of users may differ as to what concerns the reason of their queries.

2.2. Procedure

First, national suicide trend and Google search trends for the terms "suicide", "to commit suicide" and "how to commit suicide" in the years 2008–2012 were analysed. These search terms were chosen because they are univocally related with suicide and allow us to keep a better focus on suicidality avoiding data pertaining to queries of terms associated with suicide risk in a broader sense (Yang et al., 2011). Search terms that statistically lack significant lead patterns were excluded. Secondly, we investigated the correlation between the time series of national suicide rates and suicide-related search volumes in Google Search. Thirdly, we studied Google News search trends for the terms "suicide", "to commit suicide" and "how to commit suicide" in the period 2008–2012. The analysis of Google News suicide-related search trends may help to better identify the aims of online suicide-related searches possibly minimizing the effect of cross queries, (i.e. individuals who search in both search engines at the same time, due to reasons other than suicidality such as curiosity, craving for details and

shock (Corbo and Zweifel, 2013). Unfortunately, among Google News suicide-related searches some queries by people in suicidal states are likely to be present (Biddle et al., 2012). The study chose monthly counts of searches in the considered timeframe in order to have a more accurate match with national mortality data. Moreover, only data from the Italian version of Google Trends resulting from searches which were performed within the Italian territory were considered.

Hence, we investigated:

1. The trend of national suicides (2008–2012)
2. Google Search search trends for the terms "suicide", "to commit suicide" and "how to commit suicide"
3. The correlation between national suicide time series and Google Search suicide-related time series showing a statistically significant lead pattern
4. Google News search trends for the terms "suicide", "to commit suicide" and "how to commit suicide"
5. Forecasting analysis for suicide in the period 2013–2014

2.3. Statistical analyses

SAS was used for statistical analysis. Monthly online searches for the words "suicide" (suicidio), "committing suicide" (suicidarsi) and "how to commit suicide" (come suicidarsi) in Google Search (2008–2012) and monthly Italian suicide rates in the same time frame were analysed as time series. The Seasonal Autoregressive Model (AR) was used to analyse the trend of national suicides and perform a forecasting analysis for the years 2013–2014. Google search trends for the search terms "suicide", "commit suicide" and "how to commit suicide" were carried out using ARIMA. Cross-correlation analysis was performed to investigate the relationship between national suicide rates and Google search volumes for each suicide-related term.

3. Results

Overall, 20,239 suicides ranging from 223 to 472 per month occurred in Italy during the considered timeframe (see Fig. 1). The Seasonal AR model suits the trend of suicides (Table 1) that resulted periodic with 1 year cycle and peaks in May with the lowest values in December (see Fig. 1). No specific cyclicity for Google search volumes for "how to commit suicide" and "to commit suicide" were found through ARIMA (0,1,1) and ARIMA (1,0,1) respectively.

Google Search time series for "suicide" (see Fig. 2) was performed with the ARIMA (1,1,1) model and this trend was correlated with national suicide time series and lags suicides by three months (ρ=0.482, p-value < 0.001) (Table 2). No significant correlation was found between monthly Google search volumes of the terms "how to commit suicide" and "to commit suicide" (Table 2).

Table 1
Seasonal AR model for Italian suicides (2008–2012) per month.

parameter	Estimate	Standard error	p-value	lag
MU	330.225	9.054	< 0.001	0
AR(1,1)	0.838	0.126	< 0.001	12

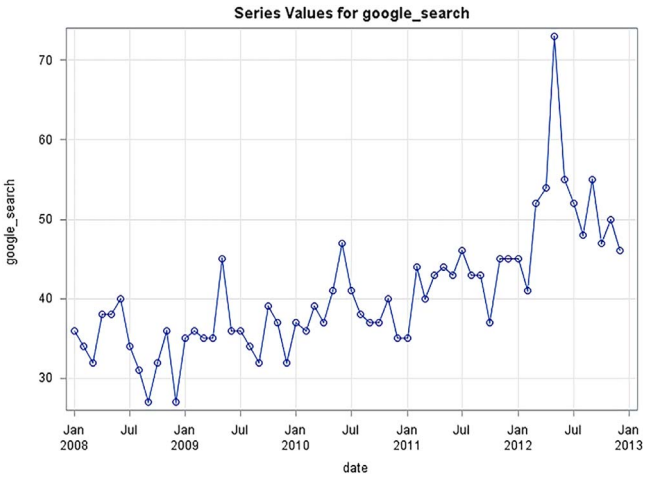

Fig. 2. Google Search volumes for the term "suicide" per month 2008–2012, Italy.

The Google News time series of the searches for "suicide", "how to commit suicide" and "to commit suicide" resulted in white noise (Table 3) and, thus, the ARIMA model cannot be applied.

On the basis of cross correlation coefficient between Google Search searches for "suicide" and national suicide time series (2008–2012) and using the data of Google Search searches for "suicide" concerning 2013–2014 that are available online, it was possible to predict a trend for suicide (Fig. 3) for the mentioned years, as official data has not been released yet. The obtained graph shows the expected 1 year cycle peaking in May in both 2013 and 2014 respectively.

4. Discussion

This study identifies a periodic 1 year cycle in Italian suicides. However, non- specific cyclicity was found for Google Search researches regarding "suicide", "how to commit suicide" and "to commit suicide". A significant correlation exists between Google Search volumes for "suicide" and national suicide time series which shows that the search trend for "suicide" lags suicide by three months. Conversely,

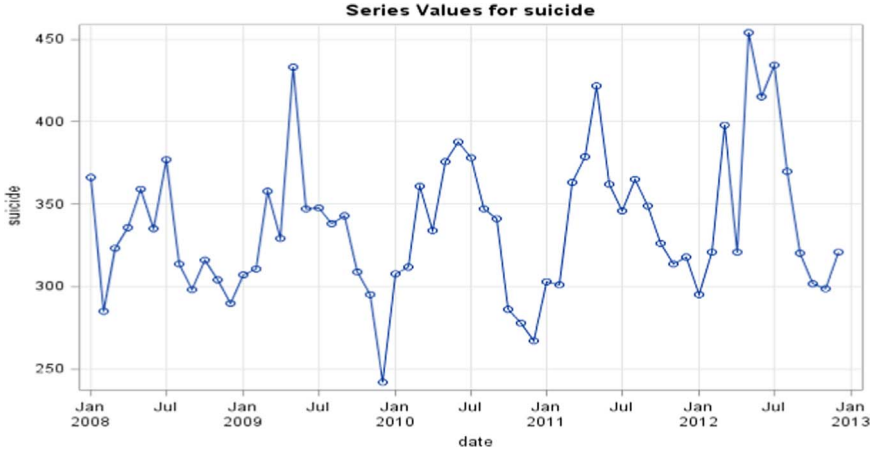

Fig. 1. National Suicides per month in Italy (from 2008 to 2012).

Table 2
Cross correlation coefficient of Google Search searches for "suicide", "to commit suicide", "How to suicide" and Italian suicides time series (2008–2012).

Lags (month)												
Google Search	0	1	2	3	4	5	6	7	8	9	10	11
Suicide	0.200	0.282	0.438	**0.482**	0.463	0.282	0.241	0.113	−0.009	−0.091	−0.060	−0.001
How to commit suicide	0.130	0.153	0.249	0.093	0.039	−0.091	−0.019	−0.315	−0.027	−0.227	0.156	0.072
To commit suicide	−0.044	−0.021	0.140	0.108	0.098	−0.037	−0.061	−0.226	−0.282	−0.311	−0.220	−0.094

Table 3
Google News time series of the searches for "suicide", "how to commit suicide" and "to commit suicide".

Autocorrelation check for white noise		
Suicide	Chi-square	*p*-value
To lag 6	9.90	0.1289
To lag 12	11.96	0.4487
How to commit suicide		
To lag 6	8.04	0.235
To lag 12	11.42	0.493
To commit suicide		
To lag 6	7.82	0.251
To lag 12	9.20	0.685

no correlation was found between national suicides and Google Search volumes for "how to commit suicide" and "to commit suicide". These results suggest that previous suicides have a trigger effect for Google Search "suicide" searches in the considered timeframe. However, these online searches do not involve active suicidality since the words more directly linked to actual attempts of committing suicide do not show any correlation with national suicides and no subsequent increase in national suicides has been reported. Furthermore, the three month lag further supports this interpretation of our results, suggesting that online searches for "suicide" could be carried out either by survivors, people shocked after suicides, people curious after a publicized suicide of a famous person or by people who developed suicidal thoughts after a suicide and seek help online. Apparently, such searches do not lead to suicide. This may be understood by hypothesizing a lack of suicidal intent in those who perform these searches (e.g. survivors) or as a possible result of anti-suicide messages and online suicide-specific forums, thereby making it probable that the Internet search would identify multiple options for support before leading to information encouraging suicide (Mok et al., 2015; Recupero et al., 2008).

Many existing studies investigated the association of the nature of the relationship between online suicide- related searches and suicidality. Harris et al. (2009) supported the link between decreased risk for suicide and Internet suicide-related use among suicidal individuals and found a decrease of suicidal feelings in 69.7% of suicide-related Internet users. The perceived impact of suicide-related Internet use was assessed in order to shed light on the consequences of these searches on subsequent suicidal behaviours (Mok et al., 2016b). They reported an overall significant decrease in participants' retrospective ratings of their suicidal thoughts and behaviour before they first went online for suicide-related reasons to the time of the survey. However, Mok et al. (2016b) warn against suicide-related Internet use which often results from suicidal ideation in the past year and predicts future suicide.

In the USA, McCarthy (2010) found a negative association between Google searches for the term "suicide" and American suicide rates in the general population, which were interpreted as resulting from a protective effect of internet searches and online suicide-related support resources. However, no "trigger" effect of committed suicide for online searches of the term "suicide" has been reported. Gunn III and Lester (2013) investigated the association of American suicide rates with suicide-related search volumes in Google Search concerning three terms ("commit suicide", "suicide prevention" and "how to commit suicide"). Although their study showed an association between national suicide rates and search volumes of the three terms as a whole and separately, no study of the time-lags was later carried out. Hagihara et al. (2012) reported positive associations between monthly Japanese suicide rates and Google search volumes of "suicide rates" and "suicide". However, no analysis of time lags was carried out either. Interestingly, Yang et al. (2011) assessed search terms representing various domains of suicide risk and found that Google searches for "major depression" and "divorce" together accounted for 30.2% of the variance in male population suicide rates in Taipei City, whereas Google searches for "anxiety" were only associated with female suicides. In addition, a temporal relationship between Internet search-trends and suicide data was reported suggesting that suicide may be interpreted as a process and a sequential act, for instance online searches for terms such as "divorce" preceded suicide data by two months. Internet search-trends for the term "suicide" coincided with suicide data (Yang et al., 2011).

Sueki (2011) reported no association between Japanese Google search volumes for the terms "suicide" and "suicide method" and Japanese suicide-rates during the period 2004–2009. However, online searches for the term "depression" were positively correlated with suicides in the same or previous month further supporting the evidence of suicide as a process and sequential act. Similarly, Bruckner et al. (2014) found that the searches that included the term "depression" were significantly associated with suicide rates in England and Wales within the same month, but reported no association between suicide rates and searches for "suicide", "suicide method" and "suicide incidence".

The contrasting evidence reported by these studies may be related to the different meanings that the searched keyword may have (the keyword "depression" the trends of which may be enhanced during difficult economic times) (Gunn III and Lester, 2013), by the possible helpfulness of suicide-related internet searches due to the possibility to communicate and connect with other individuals giving a sense of support and reducing feelings of isolation (Mok et al., 2016a). Paradoxically, a positive impact on suicidality was also reported after consulting pro-suicide websites for two reasons. First, online information on suicide methods reassured the individuals that they would have the knowledge to make an attempt if they chose to do so (Mok et al., 2016a) and, secondly, a life-affirming effect stemming from reading stark pro-suicide posts may emerge (Niezen, 2013).

In additon, Google News time series of the searches for "suicide", "how to commit suicide" and "to commit suicide" did not show any statistically significant pattern in the considered timeframe resulting in white noise. To the best of our knowledge, no previous study evaluated the trend of Google News suicide related searches and its possible relationship with suicide rates. Conversely, a large body of literature investigated the relationship between media reports and suicide rates reporting overall mild positive associations (Hagihara et al., 2007; Pirkis and Blood, 2001). To this regard, Littmann (1985) emphasized that copycat suicides may hardly be deemed to stem solely from media influence just as Wasserman (1984) and Stack (1987) reported that the imitation effects of media reports are much more limited than many studies have claimed.

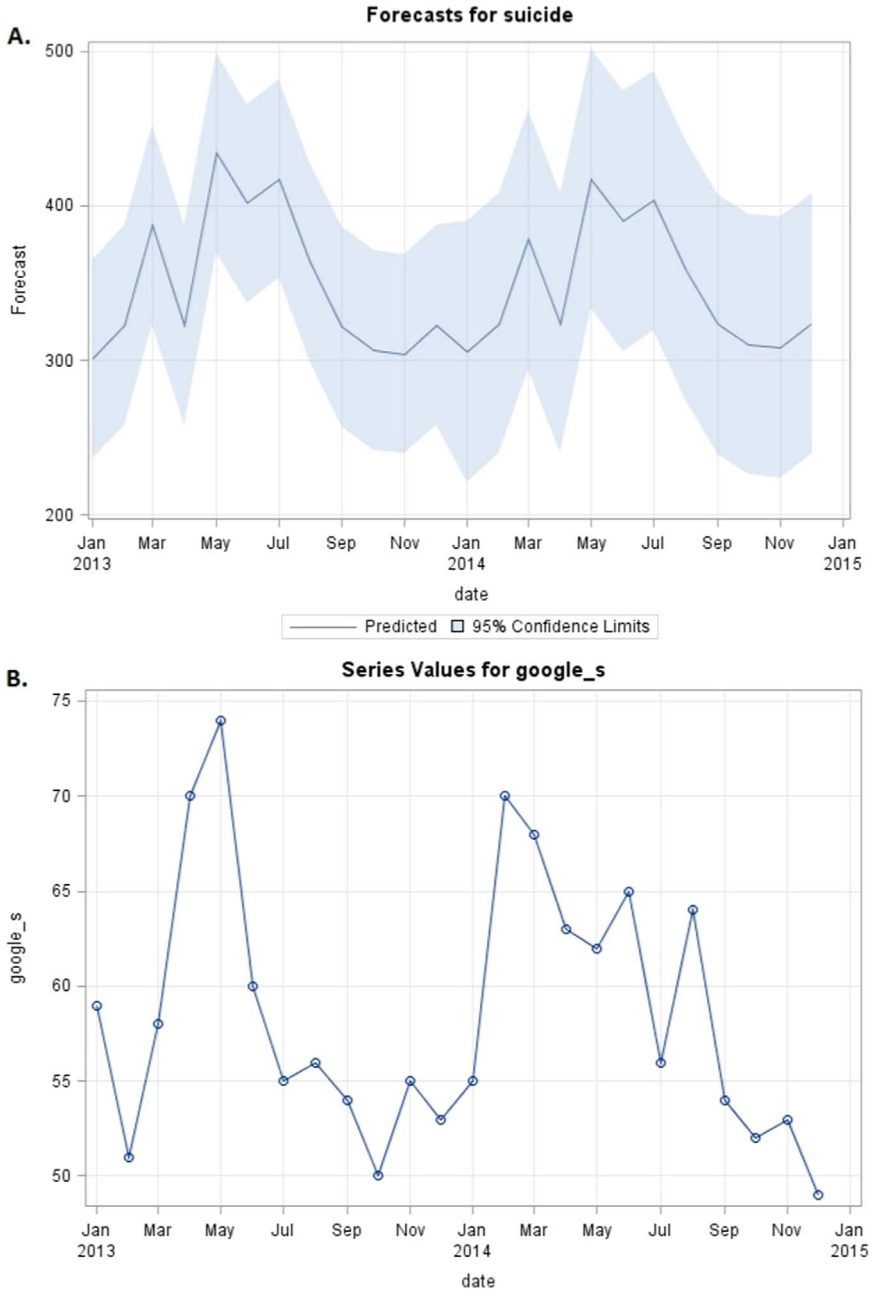

Fig. 3. A. Suicide trend forecast (2013–2014); B. Google Search trend for "suicide" (2013–2014) obtained through Google Trends.

4.1. Limitations and strengths

The limitations of this study include those of register-based studies. Reporting suicides to the ISTAT is mandatory in Italy, therefore the validity of our findings is bolstered by the large sample size, which encompasses all registered events in Italy in the study timeframe. Nevertheless, large national databases concerning suicide are not wholly reliable even though studies on the consistency and reliability of population-wide suicide data suggested that the sources of bias - mainly under-reporting and misclassification (De Leo, 2010; Goldsmith et al., 2002; Stanistreet et al., 2001; O'Carroll, 1989) - are not so widespread to invalidate official suicide rates (De Leo et al., 2006). This, however, may limit the number of registered suicides but does not alter their variation over time and, therefore, our results. Even though data retrieved on Google Trend are accurate since all the searches using this search service are automatically registered by the system, our dataset of online searches for "suicide" may underestimate the number of searches because other search engines such as Yahoo! and Altavista, have not been considered in this study. Although this may limit the number of queries it does not alter their variation over time thus the validity of our results. However, Google is the most popular online research engine (Alexa, 2015) and, to the best of our knowledge, is the only search engine providing a service that analyses research trends. In addition, Google Trends does not analyse sex and age of the users and provides normalized search volumes, which have been adjusted by Google's algorithms, thus it does not provide raw search data. Moreover, our datasets do not inform us of the reasons for the queries, which can only be inferred by the results. For instance, online searches stimulated by a committed suicide, such as those performed by survivors in the time following the suicide, may influence search trends. Furthermore, even though our datasets do not inform us of the number of people who died by suicide that had consulted Google before the act, evidence shows that there are cases in which individuals who attempted or died by suicide did so after using the Internet to

obtain information on suicide methods (Cantrell and Minns, 2011; Corkery et al., 2010; Musshoff et al., 2011; Schneider et al., 2010; Alao et al., 2006) or to obtain methods themselves (Becker et al., 2004).

Finally, we would like to remind readers that suicide is a complex phenomenon, triggered and determined by the interplay of multiple factors and, therefore, the present study has limited external validity as it analyses very specific factors. However, our results provide further original evidence of the complexity of the correlation between suicides and suicide-related Internet uses. In particular, our findings highlight the need to consider suicide-related Internet use carried out by survivors and people shocked by suicides in order to develop further dedicated help-lines and online forums moderated by professionals. Our results are the first in the field to show that online search volumes for "suicide" lag national suicide rates by three months which adds significant insight to existing literature. We suggest further studies should investigate that time span for major comprehension of the phenomenon and to shed more light on the grieving process and how suicide acts on and is emotionally dealt with by survivors and informed people.

Furthermore, to the best of our knowledge, no similar studies have been carried out in Italy, consequently the present study fills a gap in the knowledge of the correlation between suicide-related search volumes in Google Search and Google News and national suicides. Moreover, since Google Trends eliminates repeated queries from a certain user over a short period of time, the bias derived from it is minimized. Post-hoc evaluations of the suicide-rate prediction for the year 2014 could shed light on the possibility of formulating reliable predictions on actual suicide-rates that would allow a timely organization of effective prevention strategies.

5. Conclusion

The present study shows that online search volumes for the term "suicide" in Google Search are significantly associated with national suicide-rates in Italy (2008–2012) with a lag of three months. The trends of search terms more related with committing suicide and enacting suicidal behaviour did not show any correlation with national suicides, thus suggesting that these queries may be carried out by survivors, people shocked after a suicide and by people seeking help online. Although studies on online suicide-related search volumes have been carried out in many countries such as Japan, Taiwan, the United States and Australia, these studies need to be replicated in other countries in order to further explore and renew these findings. Further additional studies could also help to develop effective online prevention strategies such as online communities which could not only allow early intervention and identification of suicidal individuals but also provide an online supportive environment for both suicidal individuals and survivors seeking help.

Acknowledgements

None.

References

Alao, A.O., Soderberg, M., Pohl, E.L., Alao, A.L., 2006. Cybersuicide: review of the role of the internet on suicide. CyberPsychol. Behav. 9, 489–493.
Alexa Top Sites by Category – Search Engine Ranking, 2015. ⟨www.alexa.com/topsites/category/Computers/Internet/Searching/Search_Engines⟩ (retrieved 01.05.15).
Becker, K., Mayer, M., Nagenborg, M., El-Faddagh, M., Schmidt, M.H., 2004. Parasuicide online: can suicide websites trigger suicidal behaviour in predisposed adolescents? Nord. J. Psychiatry 5, 111–114.
Biddle, L., Gunnell, D., Owen-Smith, A., Potokar, J., Longson, D., Hawton, K., Kapur, N., Donovan, J., 2012. Information sources used by the suicidal to inform choice of method. J. Affect. Disord. 36, 702–709.
Bruckner, T.A., Mc Clure, C., Yonsu, K., 2014. Google searches for suicide and risk of suicide. Psychiatr. Serv. 65, 271–272.
Cantrell, F.L., Minns, A., 2011. Cybersuicide with "homemade Valium". Clin. Toxicol. 49, 56.
Corbo, A.M., Zweifel, K.L., 2013. Sensationalism or sensitivity: reporting suicide cases in the news media. Stud. Commun. Sci. 13, 67–74.
Corkery, J.M., Button, J., Vento, A.E., Schifano, F., 2010. Two UK suicides using nicotine extracted from tobacco employing instructions available on the Internet. Forensic Sci. Int. 199, e9–e13.
De Leo, D., 2010. Australia revises its mortality data on suicide. Crisis 31, 169–173.
De Leo, D., Burgis, S., Bertolote, J.M., Kerkhof, A.J., Bille-Brahe, U., 2006. Definitions of suicidal behavior. Crisis 27, 4–15.
Dodemaide, P., Crisp, B.R., 2013. Living with suicidal thoughts. Health Sociol. Rev. 22, 308–317.
European Centre for Disease Prevention and Control (ECDC)-Health Communication unit, 2009. Interpreting "Google Flu Trends" data for pandemic H1N1 influenza. The New Zealand experience. ⟨http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19386⟩.
Eurostat, 2015. ⟨http://ec.europa.eu/eurostat/tgm/table⟩ (accessed April 2015).
Fond, G., Brunel, L., Leboyer, M., Boyer, L., 2014. Do the treasures of "big data" combined with behavioural intervention therapies contain the key to the mystery of large psychiatric issues? Acta Psychiatr. Scand. 130, 406–407.
Fond, G., Gaman, A., Brunel, L., Haffen, E., Llorca, P.M., 2015. Google Trends®: ready for real-time suicide prevention or just a Zeta-Jones effect? An exploratory study. Psychiatry Res. 228, 913–917.
Goldsmith, S.K., Pellmar, T.C., Kleinman, A.M., Bunney, W.E., 2002. Reducing Suicide: A National Imperative. The National Academies Press, Washington, DC.
Google Trends, 2015. ⟨www.google.it/trends⟩ (accessed March 2015).
Gunn, J.F., III, Lester, D., 2013. Using google searches on the internet to monitor suicidal behavior. J. Affect. Disord. 148, 411–412.
Hagihara, A., Tarumi, K., Abe, T., 2007. Media suicide-reports, Internet use and the occurrence of suicides between 1987 and 2005 in Japan. BMC Public Health 7, 321–324.
Hagihara, A., Miyazaki, S., Abe, T., 2012. Internet suicide searches and the incidence of suicide in young people in Japan. Eur. Arch. Psychiatry Clin. Neurosci. 262, 39–46.
Harris, K.M., McLean, J.P., Sheffield, J., 2009. Examining suicide-risk individuals who go online for suicide-related purposes. Arch. Suicide Res. 13, 264–276.
International Telecommunication Union The World in ICT Facts and Figures. 2011. [2012-05-21]. Webcite ⟨http://www.itu.int/ITU-D/ict/facts/2011/material/ICTFactsFigures2011.pdf⟩.
Kemp, C.G., Collings, S.C., 2011. Hyperlinked suicide. Crisis 32, 143–151.
Littmann, S.K., 1985. Suicide epidemics and newspaper reporting. Suicide Life-Threat. Behav. 15, 43–50.
Maris, R.W., 2002. Suicide. Lancet 360, 319–326.
McCarthy, M.J., 2010. Internet monitoring of suicide risk in the population. J. Affect. Disord. 122, 277–279.
Mok, K., Jorm, A.F., Pirkis, J., 2015. Suicide-related Internet use: a review. Aust. N.Z. J. Psychiatry 49, 697–705.
Mok, K., Jorm, A.F., Pirkis, J., 2016a. The perceived impact of suicide-related internet use: a survey of young Australians who have gone online for suicide-related reasons. Digit. Health 2. http://dx.doi.org/10.1027/0227-5910/a000366.
Mok, K., Jorm, A.F., Pirkis, J., 2016b. Who goes online for suicide-related reasons? Crisis 37, 112–120.
Musshoff, F., Kirschbaum, K.M., Madea, B., 2011. An uncommon case of a suicide with inhalation of hydrogen cyanide. Forensic Sci. Int. 204, e4–e7.
Niezen, R., 2013. Internet suicide: communities of affirmation and the lethality of communication. Transcult. Psychiatry. http://dx.doi.org/10.1177/1363461512473733.
O'Carroll, P., 1989. A consideration of the validity and reliability of suicide mortality data. Suicide Life-Threat. Behav. 19, 1–16.
Page, A., Chang, S.S., Gunnell, D., 2011. Surveillance of Australian suicidal behaviour using the Internet? Aust. N.Z. J. Psychiatry 45, 1020–1022.
Pirkis, J., Blood, R.W., 2001. Suicide and the media: Part I. Reportage in nonfictional media. Crisis 22, 146–151.
Pompili, M., Serafini, G., Innamorati, M., Montebovi, F., Palermo, M., Campi, S., Stefani, H., Giordano, G., Telesforo, L., Amore, M., Girardi, P., 2012. Car accidents as a method of suicide: a comprehensive overview. Forensic Sci. Int. 223, 1–9.
Powell, J., Clarke, A., 2006. Internet information-seeking in mental health: population survey. Br. J. Psychiatry 189, 273–277.
Recupero, P.R., Harms, S.E., Noble, J.M., 2008. Googling suicide: surfing for suicide information on the Internet. J. Clin. Psychiatry 69, 878–888.
Schneider, S., Diederich, N., Appenzeller, B., Schartz, A., Lorang, C., Wennig, R., 2010. Internet suicide guidelines: report of a life-threatening poisoning using tobacco extract. J. Emerg. Med. 38, 610–613.
Stack, S., 1987. Celebrities and suicide: a taxonomy and analysis, 1948-1983. Am. Sociol. Rev., 401–412.
Stanistreet, D., Taylor, S., Jeffrey, V., Gabbay, M., 2001. Accident or suicide? Predictors of coroners' decisions in suicide and accident verdicts. Med. Sci. Law 41, 111–115.
Sueki, H., 2011. Does the volume of Internet searches using suicide-related search terms influence the suicide death rate: data from 2004 to 2009 in Japan. Psychiatry Clin. Neurosci. 65, 392–394.
Sueki, H., 2013. The effect of suicide-related Internet use on users' mental health. Crisis 34, 348–353.
Sueki, H., Eichenberg, C., 2012. Suicide bulletin board systems comparison between Japan and Germany. Death Stud. 36, 565–580.
Sueki, H., Yonemoto, N., Takeshima, T., Inagaki, M., 2014. The impact of suicidality-related internet use: a prospective large cohort study with young and middle-aged internet users. PloS One 9 (4), e94841.
Wasserman, I.M., 1984. Imitation and suicide: a reexamination of the Werther effect. Am. Sociol. Rev., 427–436.
Wong, P.W.C., Fu, K.W., Yau, R.S., Ma, H.H., Law, Y.W., Chang, S.S., Yip, P.S., 2013. Accessing suicide-related information on the internet: a retrospective observational study of search behavior. J. Med. Internet Res. 15, e3.
World Health Organization, 2014. Preventing Suicide: A Global Imperative. WHO, Luxemburg.
Yang, A.C., Tsai, S.J., Huang, N.E., Peng, C.K., 2011. Association of internet search trends with suicide death in Taipei City, Taiwan, 2004–2009. J. Affect. Disord. 132, 179–184.