

# Understanding Correlations of Loneliness in India and USA

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**Abstract.** Loneliness is a global public health issues contributing to a variety of mental and physical health issues. It also increases the risk of life-threatening conditions as well as contributes to burden on the economy in terms of the number of days lost to productivity. Loneliness is a highly varied concept though, which is a result of multiple factors. To understand loneliness this paper carries out a comparative analysis of USA and India through Twitter data on the keywords associated with loneliness. The comparative analysis on loneliness is in the vein of comparative public health literature and to contribute to develop a global public health map on loneliness. The results showed that the dynamics of loneliness through the topics correlated vary across geographical locations. Social media data can be used to capture the dynamics of loneliness which can vary from one place to another depending on the socioeconomic and cultural norms and sociopolitical policies.

**Keywords.** Loneliness, Twitter, sentiment analysis.

## 1. Introduction

The causes of mental health issues can vary from genetic, social, economic as well as immediate family or finding meaning in life. The result can be withdrawal from human bonds and touch. Loneliness can be helped through different interventions. But there is a need to understand the prevalence of loneliness to devise such technology-based and community-oriented strategies. Technology may have resulted in fragmented and individualized existence, but technology also can be a great healer. There are interventions to fight off loneliness which use technology from communication-based therapy to chatbots to robots to mobile apps. To heal loneliness and make people come out of their silent suffering through designing interventions that connect them to others, first we need to know where and why people are lonely. This can be done through the loneliness map. Building on the tools of health informatics and social media analysis of mental health, digital health, and loneliness a detailed global map of loneliness can act as a guideline and as the foundational grounding for intervention strategies.

Through the global loneliness map, the approach is to explore the relationship between loneliness and mental health issues. The map can be used to zoom in on a country where the relationship of loneliness with negative sentiment is higher to derive further analysis. Ultimately, the map when developed will also provide a correlation of linguistic features representing respective personal and social categories, such as

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relationships, sleep habits and emotional dysregulation for different categories to show how these can vary across countries. This can be helpful in recognizing and understanding the nature of association of loneliness with negative sentiments in different categories. The loneliness map will monitor the relationship of loneliness to mental health issues across the globe by analyzing the data collected through machine learning (ML) and artificial intelligence (AI) tools.

In this paper, we carry out a comparative analysis of Twitter data on loneliness from USA and India. This comparison is important because it will give us an insight into the varying and dynamic nature of loneliness in a developed country and a developing country. India and USA have the second and third largest populations in the world. China, the biggest country per population, does not give open access to Twitter as compared to India and USA. Other social media apps such as Baidu chat are more popular in China. Comparative analysis of loneliness through Twitter data between USA and India also follows practice in the public health domain where multiple aspects of healthcare and health systems and policies of the two countries are compared.

## **2. Literature Review**

The social-psychological contexts of loneliness results in lower access to public healthcare. Technology is used to fill in the gap created by lack of access to a healthcare professional or service. There are scoping reviews done for information and communication technologies (ICT) based programs and interventions for older people. Byrne et al. carried out a scoping review of reviews to study the effectiveness of communication technologies to reduce the feeling of loneliness in older people [1]. The review included 28 studies, which combined covered 248 primary studies spanning over 50 years. Hards et al., studied through a systematic review and meta-analysis of digital technologies-based intervention to reduce loneliness in older adults [2,3].

There are a number of studies which carry out comparative analysis among countries. Such comparisons point out the strength and weakness of particular legal and executive functions and practice and provides opportunity to identify gaps in a particular country legal and executive framework. Such comparisons have been carried out between USA and India too in multiple fields, varying from economics to healthcare systems. A. Khurana et al. [4] carried out a comparative study of pharmacovigilance through the legal parameters and frameworks among EU, India and the US. The study identified good pharmacovigilance practices and identified potential gaps in the frameworks. Similarly J. M. Engel provided a comparison of various cardiac arrhythmias in India and USA through data collected from a mobile cardiac telemetry system [5].

## **3. Methodology**

We used respective analysis of publicly available data of users posting about loneliness. Twitter is a social media platform which is used for connectivity and opinion sharing and allows users to post via short messages consisting of 280 characters. Twitter gives access to the users' data through its publicly available Twitter API for developers. The data we gathered was based on topic modelling through open-vocabulary topics. The relevant tweets about loneliness were gathered and stored in a database. Topics, which are



#### 4. Results and Conclusion

The data was collected from Twitter in October, 2022. The data was asymmetric and was not based for particular countries. The resulted dataset contained 4.1 million tweets. The majority of the tweets belonged to India and the USA. Tweets were extracted on the basis of country and unique user ID. The result were data frames as the data structure of Python. 1.6 million dataframes belonging to India and the same number belonging to USA were analyzed through sentiment analysis. The databases were divided into sub-databases for city-wise sentiment analysis too. Sentiment analysis is important to differentiate between the phrases and topics carrying meaningful information on loneliness and metaphorical and non-sequitur uses of the terms and topics associated with loneliness. For forming the topic and themes list of words associated with loneliness through different parameters the tweets with negative sentiment associated with loneliness were analyzed.

Fig. 1 and Fig. 2 are most frequent words associated with mention of loneliness for India and USA respectively. These figures are called wordclouds. Although the tweets were obtained using the loneliness keywords as mentioned in the previous section, the words in these figures can be seen as highly occurring topics with loneliness. Both in Fig. 1 and Fig. 2 the top wordcloud is that of topics and themes associated with positive mention of loneliness, while the bottom wordclouds represent topics associated with negative mention of loneliness. These can be important to get a general overview of the cause or correlation and association of loneliness.

The results showed variance in the sentiment associated with loneliness in different cities as well as the top correlated topics with the mention of loneliness. These results are only indicative and will need further exhaustive study. To point out for the sake of clarity, the number of tweets containing the keywords associated with loneliness can run up to millions for a particular city during a year. But the objective of this paper is not to study exhaustively each city but to determine from the data collected the sentiment associated with loneliness in order to prove that the dynamics of loneliness are not the same. The limitations of this study is that the data used is not exhaustive. The number of tweets about loneliness from a country or even a city can run into millions, while this study considers only a subset of the available data. The other limitation is that although the tweets with negative sentiment analysis are analyzed but the results of the sentiment analysis are not verified through manual methods.

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