

Contraceptive search trends after Türkiye's 2023 earthquakes: A Google Trends analysis

Türkiye 2023 depremleri sonrası doğum kontrolü arama trendleri: Bir Google Trends analizi

Salih KESKİN¹ , Türkan GÜNAY² 



doi.org/10.35232/
estudamhds.1695806

Abstract

The February 2023 Kahramanmaraş earthquakes in Türkiye caused widespread devastation, significantly disrupting health services, including reproductive health, which is often neglected in disaster response. Assessing reproductive health needs post-disaster is logistically challenging. This study leverages digital epidemiology to investigate the earthquake's impact on online information-seeking for birth control methods across eleven affected provinces. We analyzed weekly birth control-related search probability metrics from the Google Trends Research API (January 2022–December 2023), employing multilingual knowledge graph queries for enhanced coverage in diverse populations. The 12-week post-earthquake period was compared to the immediate pre-earthquake and 2022 baseline periods using Wilcoxon signed-rank tests, supplemented by time-series decomposition and anomaly detection. A significant, immediate decline in contraceptive searches occurred post-earthquake across most analyzed provinces compared to both reference periods. Recovery patterns varied markedly by earthquake impact severity; heavily affected provinces (e.g., Hatay, Kahramanmaraş) showed prolonged reductions, while less affected regions (e.g., Elazığ, Diyarbakır) stabilized faster. Regional factors like high baseline fertility (Şanlıurfa) were observed with sustained search interest. In contrast, low-population areas (Kilis) yielded minimal data, highlighting methodological limitations for Google Trends in low-search contexts. The initial sharp decline and recovery observed in online searches underscore the persistent underlying importance of reproductive health post-disaster, necessitating the timely restoration and integration of contraceptive services within response frameworks. Despite limitations, this novel digital surveillance approach provides valuable real-time insights into public health needs during crises, emphasizing the need to prioritize equitable contraceptive access, potentially through digital tools, in disaster settings.

Keywords: Contraceptive, earthquake, time series analysis, Google Trends

Özet

Şubat 2023'te Türkiye'de meydana gelen Kahramanmaraş depremleri, afet koşullarında genellikle göz ardı edilen üreme sağlığı da dâhil olmak üzere sağlık hizmetlerini ciddi biçimde sekteye uğratan geniş çaplı bir yıkıma yol açmıştır. Afet sonrasında üreme sağlığı gereksinimlerini değerlendirmek lojistik zorluklar içermektedir. Bu çalışma, depremten etkilenen on bir ilde doğum kontrol yöntemlerine yönelik çevrim içi bilgi arama davranışındaki değişimi incelemek için dijital epidemiyolojiden yararlanmıştır. Ocak 2022–Aralık 2023 dönemine ait haftalık doğum kontrolüyle ilişkili arama olasılıkları, kapsayıcılığı artırmak amacıyla çok dilli bilgi grafiği sorguları kullanılarak Google Trends Research API'sinden elde edilmiştir. Deprem sonrası 12 haftalık dönem, Wilcoxon işaretli sıra testiyle deprem öncesi 12 haftalık dönem ve 2022 yılının aynı dönemiyle karşılaştırılmış; bulgular zaman serisi analizleri ve anomali tespitiyle desteklenmiştir. İncelenen illerin çoğunda, deprem sonrasında her iki döneme kıyasla doğum kontrol aramalarında anlamlı ve ani bir düşüş saptanmıştır. Arama olasılıklarında düşme depremin şiddetine göre farklılık göstermiş; ağır etkilenen illerde (ör. Hatay, Kahramanmaraş) düşüşler uzun sürerken, daha az etkilenen bölgelerde (ör. Elazığ, Diyarbakır) bazal değerlere daha hızlı dönüş gözlenmiştir. Yüksek doğurganlığa sahip bölgelerde (ör. Şanlıurfa) aramalar stabil kalmıştır. Buna karşılık, düşük nüfuslu Kilis'te verilerin sınırlı kalması, Google Trends'in düşük arama hacimli bağlamlardaki metodolojik kısıtlarını ortaya koymuştur. Çevrim içi aramalarındaki hızlı düşüş ve ardından gelen toparlanma, afet sonrasında üreme sağlığının önemini vurgulamakta; doğum kontrolü hizmetlerinin müdahale çerçevelerine zamanında yeniden entegre edilmesinin gerekliliğine işaret etmektedir. Sınırlılıklarına rağmen bu yenilikçi surveyans yaklaşımı, kriz dönemlerinde halk sağlığı ihtiyaçlarına ilişkin gerçek zamanlı içgörüler sunmakta ve doğum kontrolüne erişimin önceliklendirilmesi gereğini vurgulamaktadır.

Anahtar Kelimeler: Kontraseptif, deprem, zaman serisi analizi, Google Trends

ESTUDAM Public Health
Journal.

2025;10(3):345-56

1-Balıkesir Karesi
Provincial Directorate of
Health, Balıkesir, Türkiye
2-Dokuz Eylül University,
Faculty of Medicine,
Department of Public
Health, İzmir, Türkiye

Sorumlu Yazar /
Corresponding Author:
Dr. Salih KESKİN, Public
Health Specialist
e-posta / e-mail:
skeskinnmd@gmail.com

Geliş Tarihi / Received:
09.05.2025

Kabul Tarihi / Accepted:
14.10.2025

Introduction

Natural disasters, particularly earthquakes, inflict profound and multifaceted impacts on societies, severely disrupting daily life and impairing critical health services. Within this disruption, reproductive health (RH) emerges as a particularly vulnerable domain. Crises can create significant challenges in accessing and maintaining essential RH care, including birth control and family planning services (1). Maintaining contraceptive services during crises is essential to prevent unintended pregnancies and to uphold public-health and human-rights standards; however, emergency plans frequently give reproductive health low priority (2–4). Compounding this, directly assessing RH needs and service gaps in disaster-stricken areas presents substantial logistical, security, and resource challenges (5,6).

In recent years, digital epidemiology has offered alternative approaches, leveraging digital data sources, especially internet search trends, as valuable tools for gauging public interest, concerns, and needs in near real-time (7). Platforms like Google Trends provide a unique opportunity to capture and analyze large-scale, anonymized data reflecting societal behaviors and online information-seeking patterns (8). This approach, often termed infodemiology or infoveillance, has been increasingly employed in public health to monitor disease outbreaks, assess responses to health crises like the COVID-19 pandemic or policy shifts such as the Dobbs v. Jackson ruling, and understand health-related interests (9–12).

While Google Trends offers significant potential for timely insights, its application is subject to known methodological considerations that require careful application and interpretation.

Data reliability can be influenced by sampling variations, algorithmic opacity, and potential confounding by external events or media coverage. Furthermore, ensuring that search terms validly represent the intended construct and acknowledging the limits of generalizability beyond the Google user population are essential steps (13–15). In disaster settings, search patterns may reflect internet outages or changed priorities as well as genuine information needs, so analysts must interpret the data carefully (1,13). Despite the growing use of digital trace data in health research, its specific application to understanding RH information-seeking behavior following large-scale natural disasters remains limited. The unique context immediately following events like major earthquakes, where access disruption and an intense focus on survival may overlay or obscure RH concerns, presents a complex scenario for interpreting online search patterns (16).

On February 6, 2023, devastating earthquakes struck Kahramanmaraş, Türkiye, resulting in over 50,000 fatalities, displacing hundreds of thousands, and causing severe disruption to public services across eleven provinces. A state of emergency was declared for 12 weeks to manage the crisis response (17). Reports indicate that official healthcare responses gave low priority to reproductive services after the earthquake, making it vital to learn how people sought RH information when formal care was impaired (18). Traditional field research in disaster-affected communities poses significant logistical and methodological challenges (5, 6). Digital health surveillance data, therefore, offers a viable, though imperfect, alternative (8, 19). Specifically, analyzing online search trends for core components of reproductive healthcare, such as widely used birth control methods,

ORCID:

Salih KESKİN:

0000-0003-4032-319X

Türkan GÜNAY:

0000-0002-0874-2637

Nasıl Atıf Yapırım /

How to Cite:

Keskin S, Günay T.

Contraceptive Search

Trends After Türkiye's

2023 Earthquakes: A

Google Trends Analysis.

ESTUDAM Public Health

Journal. 2025;10(3):345-56

provides a measurable proxy for understanding shifts in public information-seeking regarding family planning needs when direct assessment is precluded.

This study evaluates the change in online search probability for birth control methods across eleven Turkish provinces following the February 2023 Kahramanmaraş earthquakes. Utilizing weekly Google Trends data, we compare search activity during the 12-week post-earthquake period to immediate pre-earthquake levels and a corresponding baseline period from the previous year to quantify the disaster's immediate impact and characterize subsequent recovery trends.

Material and Method

Study Design and Setting

This ecological study examined changes in internet search behavior related to birth control methods following the earthquakes centered in Kahramanmaraş, Türkiye, on February 6, 2023. The analysis focused on eleven provinces (Kahramanmaraş, Adana, Adıyaman, Diyarbakır, Elazığ, Gaziantep, Hatay, Kilis, Malatya, Osmaniye, and Şanlıurfa) where a state of emergency was declared (17). These provinces were selected because they were formally included under the emergency decree.

Data Source and Data Collection

In Türkiye, Google is the dominant search engine, accounting for approximately 80.7% of the market share as of early 2023 (20). This prevalence ensures reliable access to statistical search data for research purposes. While Google Trends offers

a user-friendly interface, its normalization and rounding of search volumes between 0 and 100 can limit the precision of time series analyses. This study employed the Google Trends Research API to address these limitations, which provides granular and specific search data. This method also allows Freebase and Google Knowledge Graph IDs (GKGIDs) to enhance the comprehensiveness of queries by incorporating synonymous and conceptually related terms, thereby mitigating the constraints of a keyword-only approach.

Historically, Google relied on Freebase IDs to define search concepts, which are now integrated into GKGIDs, ensuring continuity and consistency in data retrieval. Freebase IDs, typically prefixed with "/m/," remain compatible with current search mechanisms. The search terms for this study were selected based on prior literature (21). Importantly, regions analyzed in this study, such as Kilis (37%), Gaziantep (18%), Hatay (18%), and Şanlıurfa (15%), host substantial Arabic-speaking Syrian populations (22), while Kurdish-speaking communities are also prominent in certain provinces. Given these linguistic variations, reliance solely on keyword-based queries could risk overlooking relevant searches. Using IDs ensures inclusivity and enhances the robustness of the search strategy.

Table 1 details the search terms across multiple languages alongside their corresponding IDs. The final query combined all terms using the "plus" operator:

`/g/120m5_rf + /g/122g3p1q + /m/03z1r + /m/04sc1 + /g/122tp2cx + /m/01cnz + /m/01t751"`

Table 1: Search terms and corresponding Freebase/Google Knowledge Graph IDs used to analyze reproductive health interests

Term in English	Term in Turkish	Freebase or Google Knowledge Graph IDs
combined oral contraceptive pill	doğum kontrol hapi	/g/120m5_rf
condom	prezervatif	/g/122g3p1q
intrauterine device	rahim içi araç	/m/03z1r
emergency contraception	acil kontrasepsiyon	/m/04sc1
morning-after pill	ertesi gün hapi	/g/122tp2cx
birth control	doğum kontrolü	/m/01cnz
pregnancy test	hamilelik testi	/m/01t751

Time Frame and Data Retrieval

For each province, weekly search probability data were obtained from January 2, 2022, to December 30, 2023. The year 2022 served as the baseline to ensure data comparability, as recent methodological changes to the Google Trends Research API may render data before 2022 incomparable (23). Google's weekly data aggregation starts on Sundays; since the earthquakes occurred on Monday, February 6, 2023, the post-earthquake period was defined as beginning on Sunday, February 5, 2023, to accurately capture search behavior changes following the event. Using a weekly aggregation minimized issues with zeros that can arise from daily-level data retrieval. All data were extracted via the Google Trends Research API using Python on October 1, 2024.

Sociodemographic characteristics have been presented to enhance the understanding of provincial population structures and their vulnerabilities. Population data for the provinces were obtained from TURKSTAT (24,25). However, internet usage data was only available at the combined regional level, which aligns differently from the specific earthquake-affected provinces. The researchers calculated the percentage of severely damaged or collapsed housing using the Post-Earthquake Assessment Report (17).

Variables and Outcomes

The primary outcome was the weekly search probability of queries related to birth control methods at the provincial level. The API outputs the likelihood of a query being among 10,000,000 searches, allowing for stable comparisons unaffected by overall changes in internet traffic.

Statistical Analysis

To evaluate changes in search behavior following the earthquakes, we compared the 12-week post-earthquake period (February 5, 2023, to April 29, 2023), which coincided with the declaration of a state of emergency, to two reference periods: the 12 weeks immediately preceding the earthquake (November 13, 2022, to February 4, 2023) and the same 12-week timeframe in the previous year (February 6, 2022, to May 1, 2022). This dual comparison approach allowed us to control for immediate pre-event trends and seasonal variations in search behavior. Given the potential

non-normal distribution of search probability data, we employed the Wilcoxon signed-rank test for paired comparisons between the post-earthquake period and each reference period. Additionally, anomaly detection was conducted on the time series data using Seasonal and Trend decomposition using Loess (STL) combined with the Generalized Extreme Studentized Deviate (GESD) test to identify significant deviations from expected seasonal and trend patterns. A moving average was applied to visualize underlying trends better, smoothing short-term fluctuations while preserving key patterns. All statistical analyses were performed using R version 4.2.1. Statistical significance was set at $p < 0.05$.

Sensitivity Analysis for Potential Internet Access Disruptions

A sensitivity analysis was performed to address potential confounding from unmeasured variations in internet access. Lacking direct data on post-earthquake internet or electricity continuity, we conducted a supplementary sensitivity analysis examining Google Trends for major social media platforms ('Twitter'/'X', 'Facebook', 'Instagram'). These served as a proxy for general online activity to help distinguish changes specific to contraceptive searches from potential widespread internet usage disruptions.

Ethical Considerations

This study relied exclusively on anonymized search data from the Google Trends Research API. No human participant data were obtained, and no direct participant contact occurred. As such, formal ethical approval was not required, and the study adhered to all relevant ethical guidelines for using digital data.

Results

The eleven provinces included in this analysis encompass a population of over 14 million residents, exhibiting significant variation in demographic characteristics, fertility rates, and the extent of earthquake-inflicted housing damage (Table 2). Among the 14,140,610 residents across these eleven provinces, 3,543,700 (25.0%) are women aged 15-49. The Total Fertility Rates (TFR) for 2022 varied significantly, ranging from 1.5 in Elazığ to 3.6 in Şanlıurfa. Internet usage rates within these

regions ranged from 75.3% to 83.8%. Following the earthquakes, more than 40% of housing structures were severely damaged or collapsed in Adıyaman

(52.5%), Hatay (60.2%), Kahramanmaraş (45.3%), and Malatya (44.7%), indicating substantial infrastructural devastation.

Table 2: Demographic characteristics and housing damage among populations in provinces affected by the February 6, 2023, earthquakes in Türkiye

Province	Population	Women Aged 15-49	TFR	Housing Severely Damaged or Collapsed (%)
Adana	2,274,106	574,505	1.8	0.7%
Adıyaman	635,169	159,295	2.2	52.5%
Diyarbakır	1,804,880	475,542	2.4	4.3%
Elazığ	591,497	152,817	1.5	9.5%
Gaziantep	2,154,051	554,282	2.4	10.8%
Hatay	1,686,043	421,114	2.0	60.2%
Kahramanmaraş	1,177,436	295,494	1.9	45.3%
Kilis	147,919	37,657	2.3	7.5%
Malatya	812,580	206,672	1.6	44.7%
Osmaniye	559,405	137,737	2.0	12.6%
Şanlıurfa	2,170,110	528,585	3.6	1.8%
Total	14,140,610	3,543,700	-	-

*Alphabetical order. Populations on December 31, 2022. TFR: Total Fertility Rate for 2022.

Figure 1 illustrates the geographical distribution of the earthquakes on February 6, 2023, and the locations of the eleven provinces affected by the

state of emergency decree. The map highlights the epicenters (Mw 7.7 at 04:17 and Mw 7.6 at 13:24); the affected provinces are marked in red.

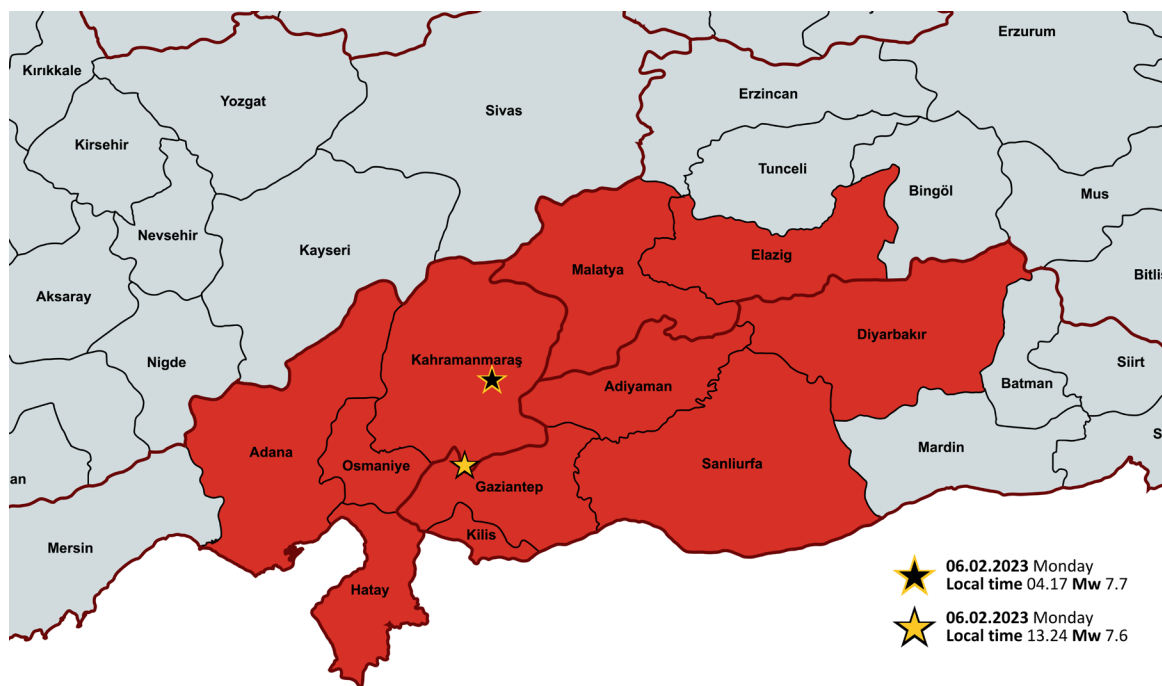


Figure 1: Geographical distribution of provinces affected by the February 6, 2023, earthquakes in Türkiye

Table 3 presents the search probabilities for birth control methods before and after the earthquakes and comparisons with the same period in 2022. Across the ten analyzed provinces (excluding Kilis), search probabilities significantly decreased in the post-earthquake period compared to both the pre-earthquake period and the same timeframe in the previous year ($p < 0.05$). In Diyarbakır, search probabilities significantly decreased post-earthquake compared to both the pre-earthquake period ($p < 0.001$) and the same period last year ($p < 0.001$), despite no significant difference between the pre-earthquake period and the same

period in 2022 ($p = 0.212$). Conversely, in Osmaniye, while there was a significant decrease in search probabilities post-earthquake compared to the pre-earthquake period ($p < 0.001$), the comparison with the same period last year did not reach statistical significance ($p = 0.803$). Şanlıurfa exhibited the highest search probabilities post-earthquake and during the same period in 2022, following Kahramanmaraş, which led to the pre-earthquake period. In contrast, Malatya consistently recorded the lowest search probabilities across all periods. Kilis failed to reach significant thresholds for most weeks, leading to zero search probability values.

Table 3: Comparison of contraception-related search probabilities before and after the February 6, 2023, earthquakes in Türkiye

Province	Pre-Earthquake Median (Min–Max)	Same Period (2022) Median (Min–Max)	Post-Earthquake Median (Min–Max)	p-value (Post vs Pre)	p-value (Post vs Last Year)	p-value (Pre vs Last Year)
Adana	4415 (1946–4831)	3794 (3228–4424)	3431 (2538–4154)	< 0.001	<0.001	<0.001
Adıyaman	4367 (1312–5664)	3871 (2257–4200)	2659 (1256–4037)	<0.001	<0.001	<0.001
Diyarbakır	4531 (1966–5158)	4435 (3403–5083)	3911 (2808–4826)	<0.001	<0.001	0.212
Elazığ	4615 (1986–5664)	4109 (2588–5284)	3382 (2021–4280)	<0.001	<0.001	0.001
Gaziantep	4622 (1365–5536)	4068 (3310–5005)	3460 (2510–5072)	<0.001	<0.001	<0.001
Hatay	4431 (1695–5082)	4131 (2975–4981)	2986 (1806–4064)	<0.001	<0.001	<0.001
Kahramanmaraş	5000 (1790–5991)	4161 (2900–5234)	2921 (1463–3795)	<0.001	<0.001	<0.001
Kilis	0 (0–6235)	0 (0–6374)	0 (0–6398)	-	-	-
Malatya	4021 (1026–5380)	3282 (2044–4303)	2299 (1292–3103)	<0.001	<0.001	<0.001
Osmaniye	4178 (1065–6244)	3920 (2030–5012)	3899 (1407–4801)	<0.001	0.803	<0.001
Şanlıurfa	4970 (2138–6137)	4677 (3907–5965)	4060 (3031–6221)	<0.001	<0.001	0.002

* Likelihood of a query being among 10,000,000 searches. Wilcoxon signed-rank test. The pre-earthquake period is from November 13, 2022, to February 4, 2023. The same period from last year (2022) is from February 6, 2022, to May 1, 2022. The post-earthquake period is from February 5, 2023, to April 29, 2023. Kilis did not reach a significant threshold for most weeks, resulting in zero values.

The temporal dynamics of weekly search probabilities visually confirm the sharp decline in contraceptive information-seeking immediately following the earthquake, followed by variable patterns of recovery across the analyzed provinces (Figure 2). The time series for Kilis is provided separately in the supplementary materials (Supplementary Figure 1). A sharp decline in search activity is observed immediately after the earthquake (red dashed line), reflecting significant disruption. By the 12th week (blue dashed line), partial recovery is evident, though many provinces, such as Hatay,

Kahramanmaraş, and Adıyaman, remain below pre-earthquake levels. Conversely, provinces like Elazığ and Diyarbakır show faster stabilization. Supporting the interpretation that this decline was specific to contraceptive information-seeking, supplementary analysis revealed that searches for general social media platforms (Facebook, Instagram) remained stable or did not significantly decrease post-earthquake, while Twitter searches notably increased, potentially reflecting its use for crisis communication (Supplementary Figure 2).

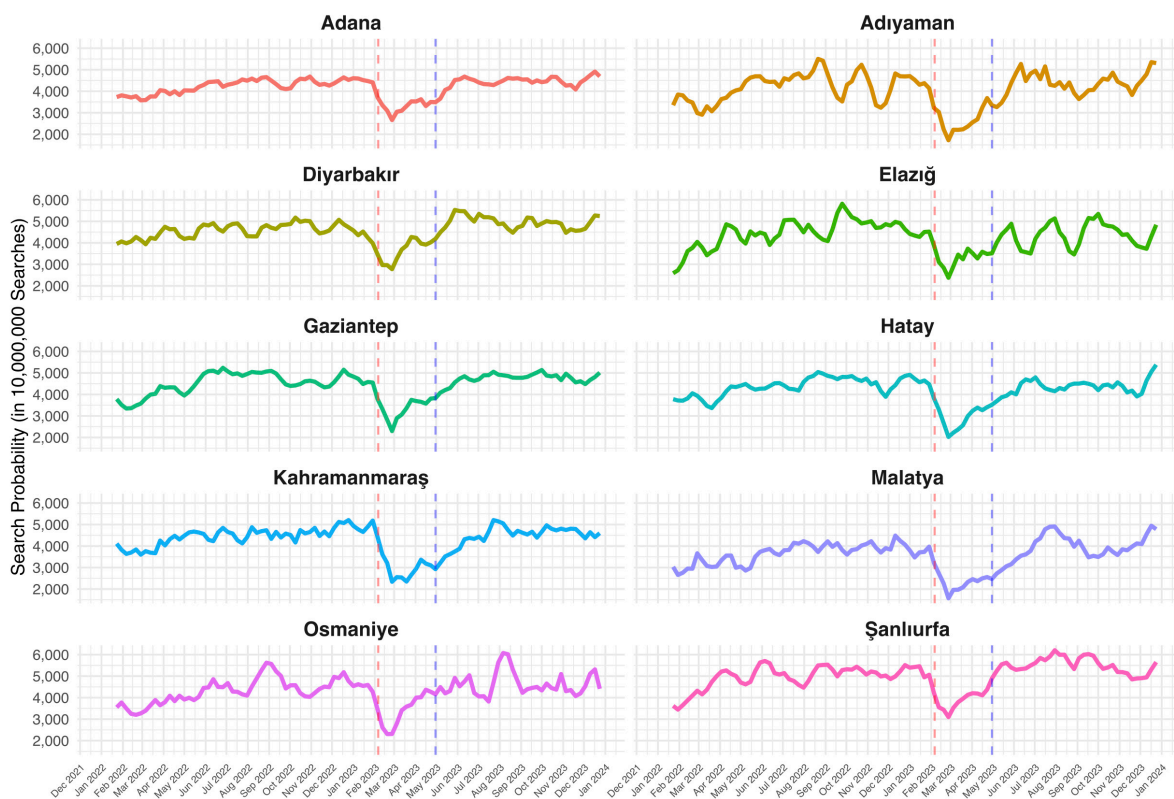


Figure 2: Trends in contraception-related search probabilities before and after February 6, 2023, earthquakes across 10 provinces in Türkiye (2022–2023)

Figure 3 illustrates the weekly search probabilities for birth control methods across ten provinces, highlighting anomalies identified through STL decomposition and the GESD test. Anomalies, represented by red points, predominantly occur immediately following the earthquake, indicating significant deviations in search behavior. Provinces such as Diyarbakır, Gaziantep, Osmaniye, and Şanlıurfa exhibit anomalies at earlier dates.

In contrast, Adana and Hatay demonstrate pronounced declines, with multiple anomalies persisting into late April. Additionally, Diyarbakır experienced a notable high anomaly in May 2023, while Şanlıurfa recorded another in September 2023. Despite substantial devastation, provinces like Kahramanmaraş and Adıyaman did not exhibit significant anomalies, nor did Elazığ. All provinces experienced a general decline in search probabilities

following the earthquake. These patterns reveal regional variations in search behavior, with most

provinces recovering swiftly, whereas Hatay faced prolonged or recurring anomalies.

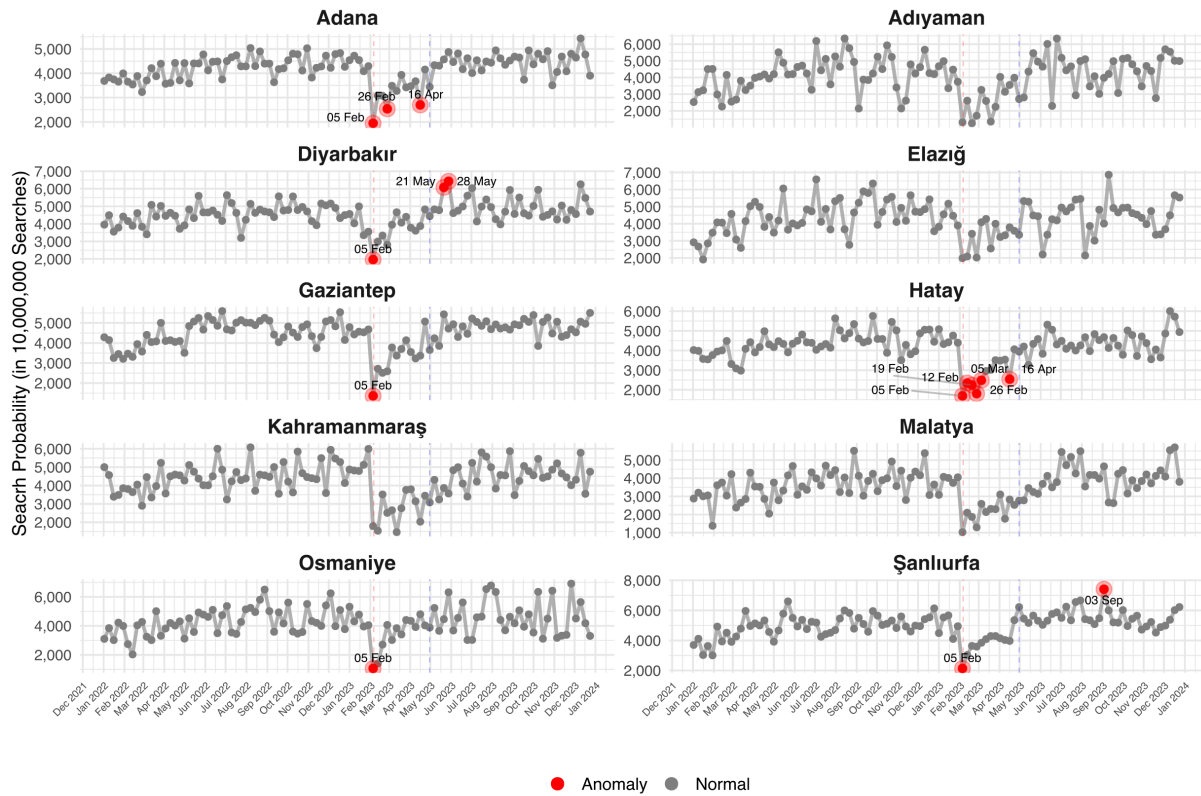


Figure 3: Anomaly detection of contraception-related search probabilities across 10 provinces in Türkiye before and after February 6, 2023

Discussion

This study shows that the Kahramanmaraş-centered earthquakes were associated with a measurable decrease in online searches for birth control methods across affected provinces. Although search volumes gradually approached baseline levels over time, the initial drop suggests that natural disasters can shift public attention and priorities away from planned reproductive health behaviors. Moreover, these changes occurred mostly outside of infrastructural damage to internet services. Google Trends Research API provides standardized search probabilities relative to the overall search volume at a given time and place. This helps mitigate confounding from general internet traffic fluctuations among those able to search.

The immediate decline in birth control-related internet searches following the earthquake can be attributed to multiple interrelated factors. Primarily,

the earthquake's devastation likely redirected the population's priorities toward immediate survival needs, such as securing shelter, food, and medical care, thereby diminishing the focus on reproductive health (26). Concurrently, disruptions to sexual and reproductive health services exacerbated this shift, restricting women's access to new family planning methods and information. Keskin Töre et al. found that many women faced challenges in obtaining family planning supplies and lacked healthcare provider support, further reducing their engagement with contraceptive information-seeking (18). Additionally, reliance on traditional birth control methods during crises may have decreased the pursuit of alternative options, as overwhelmed or inaccessible healthcare facilities prompted individuals to adhere to familiar methods. This behavior aligns with Lee et al., who reported that disasters typically negatively impact fertility-related behaviors (27).

Psychological factors may also play a critical role. Experiencing a natural disaster can lead to heightened stress and trauma, which may decrease individuals' propensity to engage in activities unrelated to immediate well-being, such as researching birth control options (28). Yet people facing housing or food insecurity showed a stronger wish to avoid pregnancy, suggesting survival worries can raise contraceptive demand (29). This paradox highlights how, despite the overall reduced focus on reproductive planning, specific subgroups may exhibit increased contraceptive needs due to intensified survival challenges. Additionally, Kuşlu et al. found that rising post-quake trauma and 'fear of happiness' sometimes coincided with better sexual life, showing disasters can both strain and deepen intimacy, thus shaping reproductive behavior (30). Gradual return to baseline in Elazığ and Diyarbakır contrasts with slower recovery in Hatay and Kahramanmaraş, reflecting differing disaster severity and response efficacy, underscoring the need for tailored recovery strategies. Şanlıurfa, a less affected region with the highest TFR of 3.6 in 2022, exhibited higher pre- and post-earthquake search probabilities for birth control. This pattern may reflect a greater underlying need for family planning services among its population. The relatively lower impact of the earthquake in Şanlıurfa likely allowed for the continuity of reproductive health services and information dissemination, facilitating sustained engagement with birth control-related searches despite the disaster.

Notably, the zero-probability values observed in low-population areas such as Kilis point to methodological limitations of using Google Trends to measure local health information demand. While other digital epidemiology studies treat zero or near-zero values as expected (21), small-volume searches may fall below the detection threshold, potentially obscuring genuine information-seeking behaviors. This limitation suggests that alternative or complementary data sources are needed for accurately capturing reproductive health needs in low-resource or low-population contexts.

Limitations of this study include the inability to link search probability data directly to individual-level health outcomes or confirm that internet search activity accurately represents unmet reproductive

health needs. The absence of provincial-level internet usage rates, the relatively short temporal window, and the reliance on a single data source may limit the breadth of interpretations. Most importantly, the inability of Google Trends to accurately reflect search interest in low-population areas underlines the need for more granular and mixed-methods approaches. Future research should consider integrating qualitative data, geographic information system mapping, and longitudinal analyses to better capture the complex and evolving nature of reproductive health concerns following disasters.

Conclusions

In conclusion, this study demonstrates that birth control-related searches initially declined following the Kahramanmaraş-centered earthquakes but quickly returned to baseline levels, reflecting a rapid resurgence of interest in reproductive health as immediate survival needs were addressed. While reproductive health may not be the priority in disaster settings, its swift rebound highlights its importance. These findings emphasize the need to prioritize the timely restoration of sexual and reproductive health services in disaster recovery plans to meet renewed demand efficiently, prevent unintended pregnancies, and support long-term health outcomes in affected populations.

References

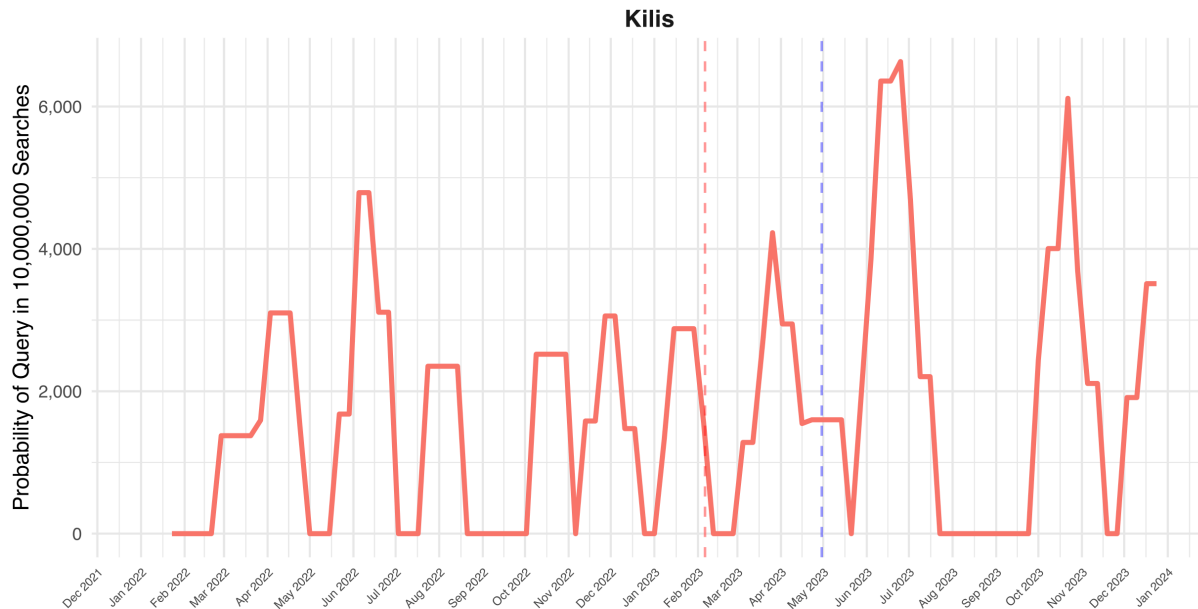
1. Rich S, Jacobi L, Talbi N, Wolfington A, McDonald K. No matter when or where: addressing the need for continuous family planning services during shocks and stressors. *Glob Health Sci Pract.* 2024;12(6):e2400124. DOI:10.9745/GHSP-D-24-00124.
2. Chaudhary P, Vallese G, Thapa M, Alvarez VB, Pradhan LM, Bajracharya K, et al. Humanitarian response to reproductive and sexual health needs in a disaster: the Nepal Earthquake 2015 case study. *Reprod Health Matters.* 2017;25(51):25-39. DOI:10.1080/09688080.2017.1405664.
3. Liu S, Han J, Xiao D, Ma C, Chen B. A report on the reproductive health of women after the massive 2008 Wenchuan earthquake. *Int J Gynaecol Obstet.* 2010;108(2):161-4. DOI:10.1016/j.ijgo.2009.08.030.
4. Singh L, Abbas SM, Roberts B, Thompson N, Singh NS. A systematic review of the indirect impacts

- of COVID-19 on sexual and reproductive health services and outcomes in humanitarian settings. *BMJ Glob Health*. 2023 Nov;8(11):e013477. DOI:10.1136/bmjgh-2023-013477.
5. Singh NS, Smith J, Aryasinghe S, Khosla R, Say L, Blanchet K. Evaluating the effectiveness of sexual and reproductive health services during humanitarian crises: a systematic review. *PLoS One*. 2018;13(7):e0199300. DOI:10.1371/journal.pone.0199300.
 6. Sohrabizadeh S, Jahangiri K, Jazani RK. Reproductive health in the recent disasters of Iran: a management perspective. *BMC Public Health*. 2018;18(1):389. DOI:10.1186/s12889-018-5311-2.
 7. Mavragani A, Ochoa G, Tsagarakis KP. Assessing the methods, tools, and statistical approaches in Google Trends research: systematic review. *J Med Internet Res*. 2018;20(11):e9366. DOI:10.2196/jmir.9366.
 8. Satpathy P, Kumar S, Prasad P. Suitability of Google Trends™ for digital surveillance during ongoing COVID-19 epidemic: a case study from India. *Disaster Med Public Health Prep*. 2021;17(e28):1-10. DOI:10.1017/dmp.2021.249.
 9. Cheng RFJ, Fisher AC, Nicholson SC. Interest in home birth during the COVID-19 pandemic: analysis of Google Trends data. *J Midwifery Womens Health*. 2022 ;67(4):427-34. DOI:10.1111/jmwh.13341.
 10. Flores L, Kelani Z, Chandwani C, Young SD. Internet searches for self-managed abortion after Roe v Wade overturned. *JAMA Surg*. 2023;158(9):976-7. DOI:10.1001/jamasurg.2023.2410.
 11. Li H, Zhang N, Ma X, Wang Y, Yang F, Wang W, et al. Google Trends applications for COVID-19 pandemic: a bibliometric analysis. *Digit Health*. 2025;11:20552076241310055. DOI:10.1177/20552076241310055.
 12. Parikh N, Kemble J, Dutcher A, Bonakdarhashemi M, Ziggelman M, Kohler T, et al. Determining the impact of the reversal of Roe v Wade on birth control and infertility trends using Google Trends. *Cureus*. 2024;16(11):e74503. DOI:10.7759/cureus.74503.
 13. Chapman GE, Ishlek I, Spoors J. Google search behaviour relating to perinatal mental wellbeing during the United Kingdom's first COVID-19 lockdown period: a warning for future restrictions. *Arch Womens Ment Health*. 2021;24(4):681-6. DOI:10.1007/s00737-021-01110-x.
 14. Hölzl J, Keusch F, Sajons C. The (mis)use of Google Trends data in the social sciences: a systematic review, critique, and recommendations. *Soc Sci Res*. 2025;126:103099. DOI:10.1016/j.ssresearch.2024.103099.
 15. Rovetta A. Google Trends in infodemiology: methodological steps to avoid irreproducible results and invalid conclusions. *Int J Med Inform*. 2024;190:105563. DOI:10.1016/j.ijmedinf.2024.105563.
 16. Soeiro RE, de Siqueira Guida JP, da-Costa-Santos J, Costa ML. Sexual and reproductive health needs for forcibly displaced adolescent girls and young women (10–24 years old) in humanitarian settings: a mixed-methods systematic review. *Reprod Health*. 2023;20(1):174. DOI:10.1186/s12978-023-01715-8.
 17. Presidency of Strategy and Budget (TR). 2023 Kahramanmaraş and Hatay Earthquakes Report [Internet]. Ankara: Presidency of Strategy and Budget; 2023 [cited 2025 Jun 29]. Available from: <https://www.sbb.gov.tr/wp-content/uploads/2023/03/2023-Kahramanmaras-and-Hatay-Earthquakes-Report.pdf>
 18. Keskin Töre F, Ağralı C, Nacar G. Changes in family planning methods and sexual behaviors after Türkiye's earthquake and the effect on quality of sexual life. *Am J Fam Ther*. 2024;52(5):537-551. DOI:10.1080/01926187.2023.2301541.
 19. Mavragani A, Ochoa G. Google Trends in infodemiology and infoveillance: methodology framework. *JMIR Public Health Surveill*. 2019;5(2):e13439. DOI:10.2196/13439.
 20. StatCounter. StatCounter Global Stats: search engine market share Turkey 2023 [Internet]. Dublin: StatCounter; 2023 [cited 2024 Dec 10]. Available from: <https://gs.statcounter.com/search-engine-market-share/all/turkey/2023>
 21. Błajda J, Kucab A, Miazga A, Masłowski M, Kopańska M, Nowak A, et al. Google Trends analysis reflecting Internet users' interest in selected terms of sexual and reproductive health in Ukraine. *Healthc (Basel)*. 2023;11(11):1541. DOI:10.3390/healthcare11111541.
 22. Ministry of Interior, Presidency of Migration Management (TR). Syrians under temporary protection [Internet]. 2023 [cited 2024 Dec 16]. Available from: <https://web.archive.org/web/20230131133756/https://en.goc.gov.tr/>

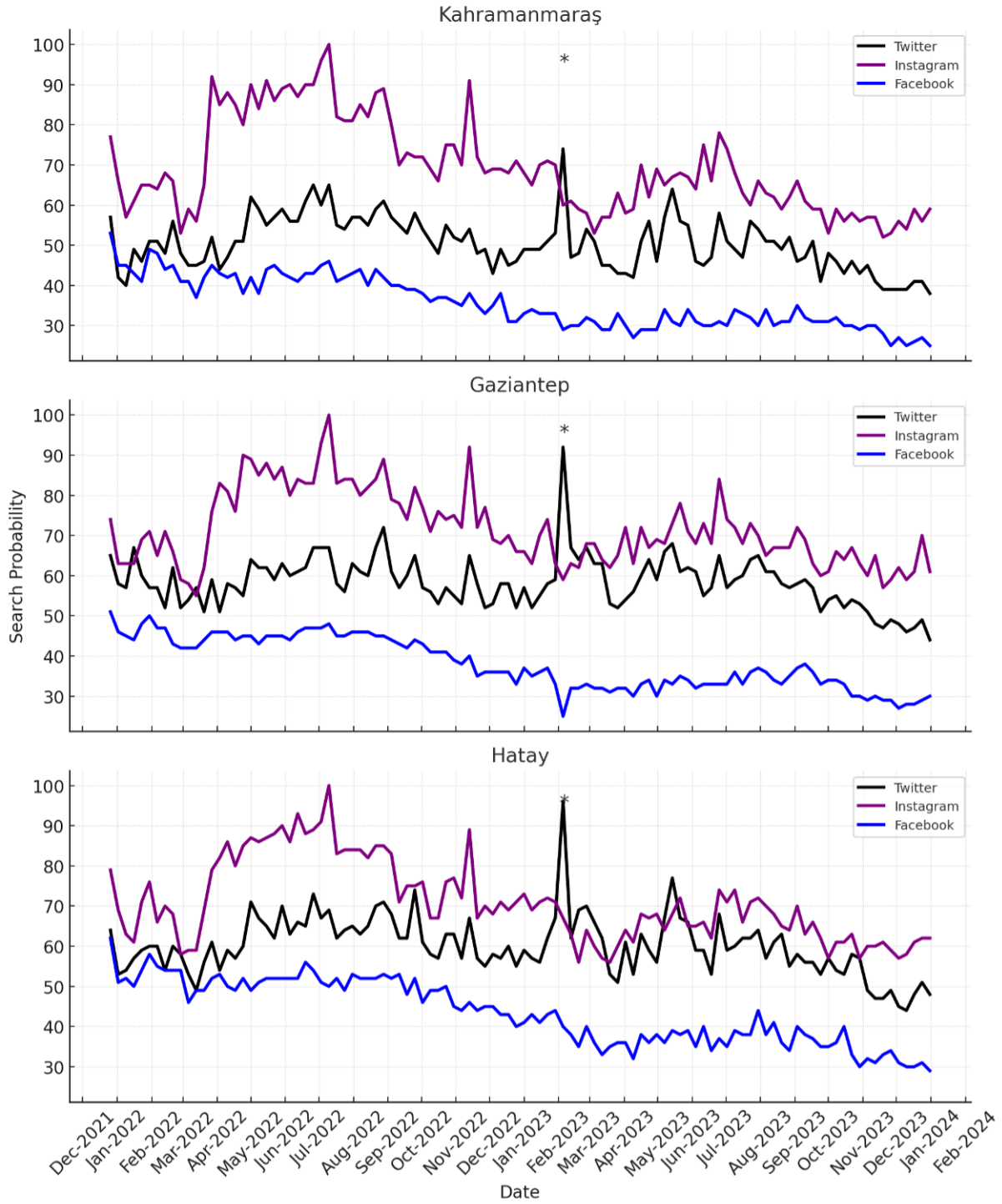
temporary-protection27

23. Myburgh PH. Infodemiologists beware: recent changes to the Google Health Trends API result in incomparable data as of 1 January 2022. *Int J Environ Res Public Health*. 2022;19(22):15396. DOI:10.3390/ijerph192215396.
24. TURKSTAT. The results of address-based population registration system, 2022 [Internet]. Ankara: Turkish Statistical Institute; 2023 [cited 2025 Jun 29]. Available from: <https://data.tuik.gov.tr/Bulten/Index?p=49685>
25. TURKSTAT. Survey on information and communication technology (ICT) usage in households and by individuals, 2023 [Internet]. Ankara: Turkish Statistical Institute; 2023 [cited 2024 Dec 11]. Available from: [https://data.tuik.gov.tr/Bulten/Index?p=Hanehalki-Bilisim-Teknolojileri-\(BT\)-Kullanim-Arastirmasi-2023-49407](https://data.tuik.gov.tr/Bulten/Index?p=Hanehalki-Bilisim-Teknolojileri-(BT)-Kullanim-Arastirmasi-2023-49407)
26. Loewen S, Pinchoff J, Ngo T, Hindin M. The impact of natural disasters and epidemics on sexual and reproductive health in low- and middle-income countries: a narrative synthesis. *Int J Gynaecol Obstet*. 2021;157(1):11-8. DOI:10.1002/ijgo.13768.
27. Lee DS, Batyra E, Castro A, Wilde J. Human fertility after a disaster: a systematic literature review. *Proc Biol Sci*. 2023;290(1998):20230211. DOI:10.1098/rspb.2023.0211.
28. Akça EI, Öztaş HG. Post-earthquake spiritual well-being and depression levels of postpartum women in Turkey. *Psychol Health Med*. 2025;30(3):489-501. DOI:10.1080/13548506.2024.2430859.
29. Özşahin Z. Determinants of the desire to avoid pregnancy after the disaster of the century in Türkiye. *BMC Womens Health*. 2024;24(1):496. DOI:10.1186/s12905-024-03330-6.
30. Kuşlu S, Eminoğlu A, Bulut A. A cross-sectional study on the relationship between trauma levels and fear of happiness with sexual quality of life in women earthquake survivors. *Health Care Women Int*. 2025;46(4):469-85. DOI:10.1080/07399332.2024.2404144.

Supplementary Materials



Supplementary Figure 1: Trends in search probabilities before and after the earthquake in Kilis (2022-2023)



Supplementary Figure 2: Google Trends search probability for social media platforms in Kahramanmaraş, Gaziantep, and Hatay provinces (2022-2023)

Note: The asterisk (*) indicates the week of February 6, 2023.