The Digital Footprint of Europe's Refugees

Online searches in 2015 and 2016 open window into path, timing of migrant flows from Middle East to Europe

BY *Phillip Connor*

FOR MEDIA OR OTHER INQUIRIES:

Phillip Connor, Research Associate
Mark Hugo Lopez, Director of Global Migration and Demography
Stefan Cornibert, Communications Manager

202.419.4372

www.pewresearch.org

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Terminology

"Refugees" and "asylum seekers" are people who have crossed international borders to receive protection from persecution, war or violence. These populations remain refugees or asylum seekers until they are permanently resettled outside of their birth countries or return to their homelands. Even though "refugee" can denote a certain legal status in Europe, the terms "refugee," "asylum seeker" and "migrant" are used interchangeably in this report to describe this population.

"Europe" is used in this report as shorthand for the 28 nation-states that form the European Union (EU) as well as Norway and Switzerland, for a total of 30 countries. At the time of this report's publication, the UK was still part of the European Union, although the country voted on June 23, 2016 to leave the EU.

"Internet searches" and "online searches" are used interchangeably and refer to searches users enter into search engines. The data used for this report relies on searches made on Google (see Google Trends below).

"Google Trends" is an analytical tool that reports the standardized volume of internet search terms on a scale of 0 to 100 entered into google.com during a specified period of time, based on location and language. This project uses data from the publicly available Google Trends website. See methodology for more information.

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Migrants leaving their homes for a new country often carry a smartphone to communicate with family that may have stayed behind and to help search for border crossings, find useful information about their journey or search for details about their destination. The digital footprints left by online searches can provide insight into the movement of migrants as they transit between countries and settle in new locations, according to a new Pew Research Center analysis of refugee flows between the Middle East and Europe.[1]

Refugees from just two Middle Eastern countries – Syria and Iraq – made up a combined 38% of the record 1.3 million people who arrived and applied for asylum in the European Union, Norway and Switzerland in 2015 and a combined 37% of the 1.2 million first-time asylum applications in 2016. Most Syrian and Iraqi refugees during this period crossed from Turkey to Greece by sea, before continuing on to their final destinations in Europe.

Syrian and Iraqi migration to Europe in 2015 and 2016

Note: Migration paths are representational, not precise. Migrants from Syria and Iraq have settled in many European countries, but Germany received the most in 2015 and 2016.
Source: National Geographic: "The World's Congested Human Migration Routes in 5 Maps".
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[1] This analysis comparing Google Trends with migration data uses a different methodology from an earlier Pew Research Center report focused on news coverage of the Flint water crisis. Unlike the earlier study on news consumption, the analysis of this report is based on *publicly* available data from Google. See this report's methodology for more details.

Since many refugees from Syria and Iraq speak Arabic as their native, if not only, language, it is possible to identify key moments in their migration by examining trends in internet searches conducted in Turkey using Arabic, as opposed to the dominant Turkic languages in that country. For example, Turkey-based searches for the word "Greece" in Arabic closely mirror 2015 and 2016 fluctuations in the number of refugees crossing the Aegean Sea to Greece. The searches also provide a window into how migrants planned to move across borders – for example, the search term "Greece" was often combined with "smuggler." In addition, an hourly analysis of searches in Turkey shows spikes in the search term "Greece" during early morning hours, a typical time for migrants making their way across the Mediterranean.

Comparing online searches with migration data

This report's analysis compares data from internet searches with government and international agency refugee arrival and asylum application data in Europe from 2015 and 2016. Internet searches were captured from Google Trends, a publicly-available analytical tool that standardizes search volume by language and location over time. The analysis examines searches in Arabic, done in Turkey and Germany, for selected words such as "Greece" or "German" that can be linked to migration patterns. For a complete list of search terms employed, see the methodology. Google releases hourly, daily and weekly search data.

Google does not release the actual number of searches conducted but provides a metric capturing the relative change in searches over a specified time period. The metric ranges from 0 to 100 and indicates low- or high-volume search activity for the time period. Predicting or deciphering human behavior from the analysis of internet searches has limitations and remains experimental. But, internet search data does offer a potentially promising way to explore migration flows crossing international borders.

Migration data cited in this report come from two sources. The first is the United Nations High Commissioner for Refugees (UNHCR), which provides data on new arrivals into Greece on a monthly basis. The second is first-time asylum applications from Eurostat, Europe's statistical agency. Since both Syrian and Iraqi asylum seekers have had fairly high acceptance rates in Europe, it is likely that most Syrian and Iraqi migrants entering during 2015 and 2016 were counted by UNHCR and applied for asylum with European authorities.

The unique circumstances of this Syrian and Iraqi migration – the technology used by refugees, the large and sudden movement of refugees and language groups in transit and destination countries – presents a unique opportunity to integrate the analysis of online searches and migration data. The conditions that permit this type of analysis may not apply in other circumstances where migrants are moving between countries.

Once in Europe, nearly six-in-ten (57%) Syrian and Iraqi refugees in 2015 and 2016 applied for asylum in Germany. Just as with Turkey, Germany's population is largely non-Arabic speaking.[2] The trend in the monthly number of asylum applications in Germany closely mirrors online Arabic searches from Germany. For example, in 2015 and 2016, Arabic-language searches for the word "German" – a likely search term for arrivals navigating their new environment – follow similar changes in the number of monthly asylum applications of Syrian and Iraqi migrants in Germany, according to the Center's analysis.

From Turkey to Greece: Internet searches and migrant flows into Europe

During 2015 and 2016, hundreds of thousands of people traveled by boat from the Turkish coast to the shores of Greece, hoping to gain refugee status in Europe. Many of these asylum seekers used smartphones during their journey, which provided access to information and maps, as well as travel advice via social media.[3]

At the time, migrants transiting Turkey largely were from Syria and Iraq, both predominantly Arabic-speaking countries. It is likely that in 2015 and 2016 these same migrants were responsible for most Arabic internet searches in Turkey – a country where Turkish is the predominant language.

Arabic-language Google searches in Turkey for the word "Greece" peaked in August 2015; two months later, the volume of migrants arriving in Greece also peaked. Plausibly, this is more than a coincidence. The two-month gap between the peak volume of searches and the peak number of new asylum applicant arrivals in Greece could be explained by the time it takes migrants to arrange for passage and to be processed upon arrival.[4]

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[2] Arabic is the primary language of Syrians and Iraqis in their home countries, but about 1% of the non-refugee population in Turkey speaks the language. Similarly, an estimated 0.5% (or about half a million) of Germany's population spoke Arabic prior the arrival of most Syrian and Iraqi refugees in 2015 and 2016, based on the foreign-born population from Arabic-speaking countries, according to migrant stock data from the United Nations for mid-year 2015.

[3] A 2013 report sponsored by the Turkish government indicates that nearly 90% of Syrian refugees in Turkey had a mobile phone and used it to communicate with relatives in Syria.

[4] Monthly refugee arrivals represent all nationalities, not only Syrians and Iraqis. Exact origins of refugees entering Greece each month are unavailable. However, annual refugee origins are available. Syrians and Iraqis, for example, were nearly two-thirds (65%) of all sea arrivals in 2015 and 2016 combined.

The relationship between Arabic searches for the word "Greece" in Turkey and arrivals into Greece

were not as highly linked following the [EU-Turkey deal](#), a plan to stem the flow of migrants from Turkey into Greece implemented by EU and Turkish officials on March 20, 2016. Following the deal, refugee arrivals averaged between 2,000 and 3,000 each month. Nonetheless, online searches for "Greece" in Arabic continued at nearly pre-surge levels. In other words, would-be migrants likely continued to search for migration help, but many did not actually migrate, possibly because of the new travel restrictions.

Surge of Arabic searches for 'Greece' in Turkey preceded surge in refugees arriving in Greece

Google Trends: Relative volume of Arabic-language Google searches for "Greece" by users in Turkey
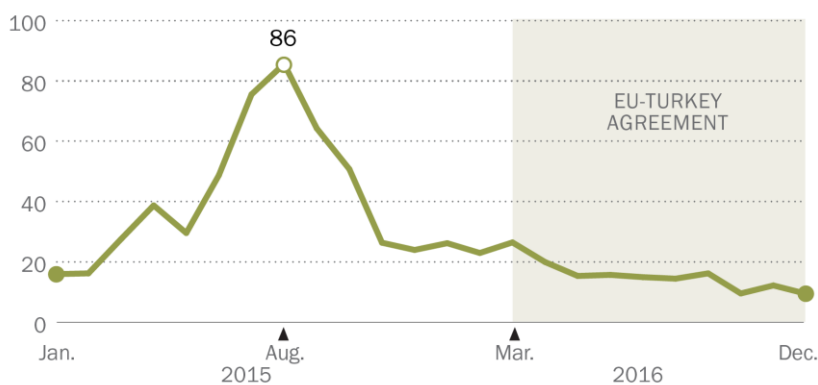
Monthly arrivals (in thousands) of migrants into Greece
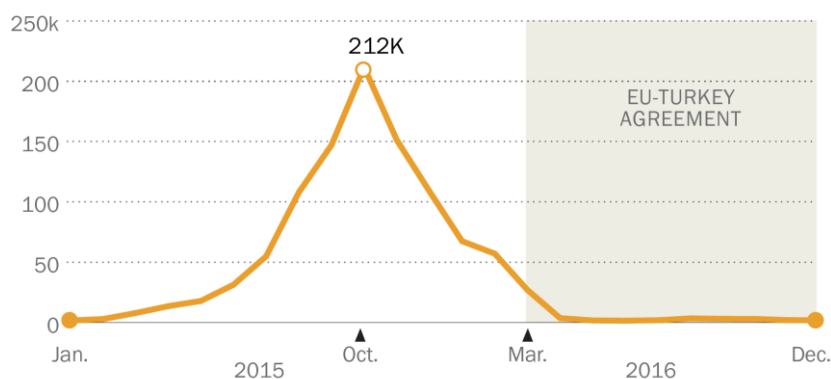
Note: Google trends data do not indicate the number of searches but instead are standardized data, displaying the relative change in searches over the time period on a 0 to 100 scale. Google trends are monthly averages based on weekly volume. Search data are for the term "Greece" in Arabic (اليونان). Arrivals into Greece are for all nationalities, not only Arabic speakers. See methodology for more details.
Sources: Pew Research Center analysis of Google Trends (accessed on March 3, 2016, at 1:17 p.m.) and United Nations High Commissioner for Refugees (UNHCR) data, accessed March 13, 2017.
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Analysis by the hour, rather than month, reveals that the search term "Greece" was most frequently searched between 1 a.m. and 3 a.m., local time, particularly before the EU-Turkey agreement was implemented.[5] Separate reporting finds that many migrants made the journey across the Eastern Mediterranean in the middle of the night.[6]

In Turkey, daily Arabic internet searches for 'Greece' peaked after midnight

Google Trends: Relative volume of Arabic-language Google searches for "Greece" by users in Turkey, prior to EU-Turkey deal
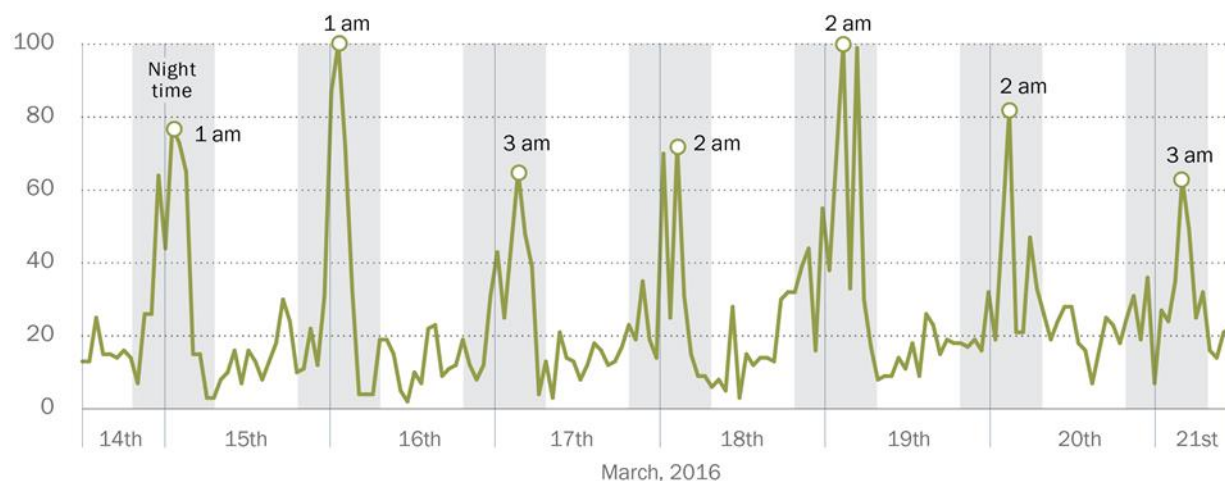
Note: Google trends data do not indicate the number of searches but instead are standardized data, displaying the relative change in searches over the time period on a 0 to 100 scale. Times are local and display nightly peak search hours. Search data are for the term "Greece" in Arabic (اليونان). See the methodology for more details.
Source: Pew Research Center analysis of Google Trends, accessed March 22, 2016.
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[5] Google Trends only releases hourly data for the previous seven days. Google Trends data for March 14 to 21 was captured on March 22, 2016, and is no longer publicly available. Analyses of most recent weeks when migration between Turkey and Greece has largely subsided do not always reveal the same pattern.

[6] An analysis of Google AdWords, a marketing tool that assists businesses in selecting the best terms for increasing traffic to their company website, indicates that monthly number of Arabic searches for "Greece" in Turkey were under 10,000 for most months. This smaller, monthly number of searches than actual migrants, combined with data showing search peaks in the middle of the night, suggests that internet users were primarily searching the web for migration purposes. See this report's methodology for more details.

Online Arabic searches in Turkey for the term "Greece" also track with the number of people from Syria and Iraq applying for asylum in EU countries, plus Norway and Switzerland. For example, the surge in online searches was followed by a spike in asylum applications from these countries one to two months later. Again, this is likely more than coincidence, as for some Syrian and Iraqi migrants the journey through Greece and on to other countries further north (mostly to Germany, Hungary or Sweden) could take weeks.

Following the EU-Turkey agreement, both online searches and number of asylum applications sharply fell, and continued to steadily decline throughout most of 2016. However, a closer examination finds that the month to month relationship between online searches for "Greece" and subsequent asylum applications is not as strong following the EU-Turkey deal.

Monthly applications for asylum in Europe in 2015 and 2016 closely follow Arabic internet searches for 'Greece' in Turkey

Google Trends: Relative volume of Arabic-language Google searches for "Greece" by users in Turkey
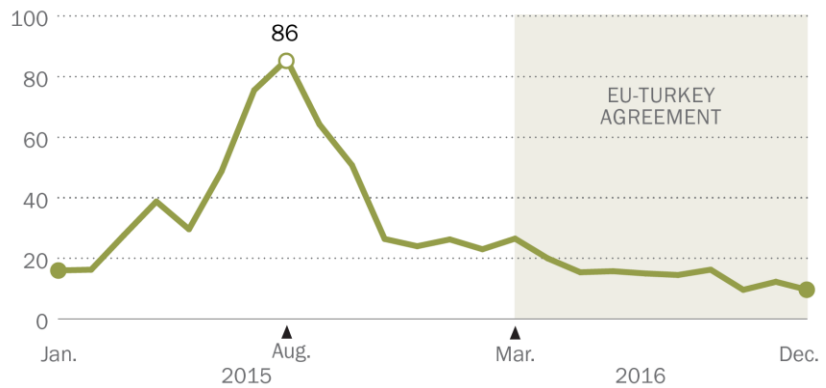
Syrian and Iraqi first time asylum applications (in thousands) in European Union countries, Norway and Switzerland
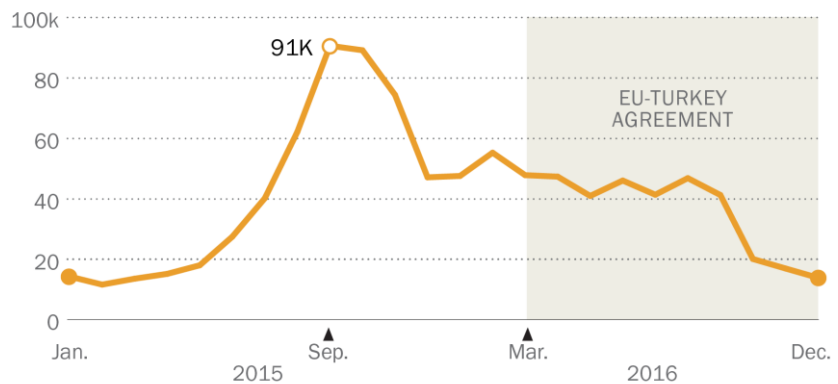
Note: Google trends data do not indicate the number of searches but instead are standardized data, displaying the relative change in searches over the time period on a 0 to 100 scale. Google trends are monthly averages based on weekly volume. Search data are for the term "Greece" in Arabic (الـ يوذان). See methodology for more details.
Sources: Pew Research Center analysis of Google Trends (accessed on March 3, 2016, at 1:17 p.m.) and Eurostat asylum application data, accessed May 17, 2017.
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Into Germany: Internet searches also show refugee arrivals

The digital footprints of migrants are not just limited to their initial journey. Once within Europe, refugees are expected to apply for asylum in the first European country they enter, and wait in that country for their applications to be processed.[7] However, some refugees move between European countries, applying for refugee status in more than one along the way.[8]

Online, Arabic-language searches for the word "German" in the country of Germany provide another indicator of the migration flow of Syrians and Iraqis into Europe. (The search term "German" is a likely word new migrants would search when trying to translate text from Arabic to German online or to learn new German words). Online searches for "German" track with the number of new asylum applications of Syrian and Iraqi migrants in Germany for most of 2015 and 2016.

Migration from Turkey to Greece dropped off considerably following the EU-Turkey agreement in March 2016. But it appears that even though Syrian and Iraqi refugees may have largely stopped traveling to Europe after the agreement, Syrians and Iraqis already in Europe, such as those in Hungary, continued to find ways to enter Germany and other European countries and apply for asylum there. And several months could have passed before applications were registered within Germany, even though the refugees had arrived much earlier.

Google searches in Arabic for "German" remained strong even though asylum applications in Germany dropped off significantly by October 2016. As indicated by a growing number of new arrivals enrolled in German integration courses, Syrians and Iraqis may have continued to search for the term "German" even though the number of asylum applications has fallen.

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[7] As per the Dublin regulation, asylum applicants are to apply in the first European country they enter. If they do not, they can be returned to the arrival country. However, that regulation was temporarily suspended by Germany during the height of the refugee crisis, permitting refugees to pass through several European countries in their journey to Germany.

[8] Eurostat recognizes that some countries may over count first-time applications even with increased information sharing on refugee applications between EU member-states using the EURODAC system.

Arabic internet searches for 'German' in Germany tracks closely with monthly applications for asylum in 2015 and 2016

Google Trends: Relative volume of Arabic-language Google searches for "German" by users in Germany
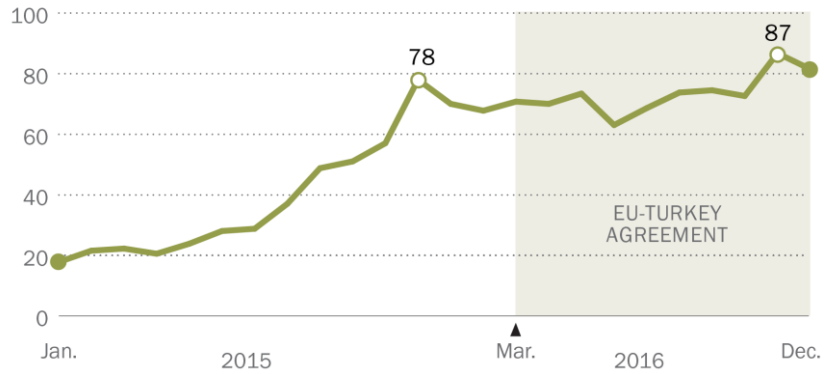
First-time asylum applications (in thousands) of Syrians and Iraqis in Germany
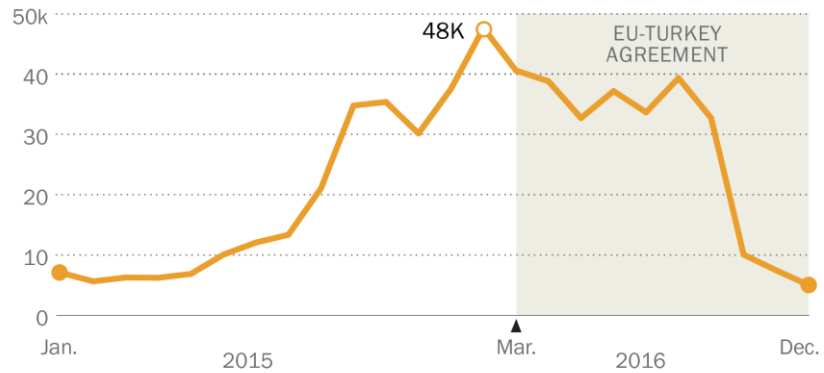
Note: Google trends data do not indicate the number of searches but instead are standardized data, displaying the relative change in searches over the time period on a 0 to 100 scale. Google trends are monthly averages based on weekly volume. Search data are for the term "German" in Arabic (الأل ماد ية). See methodology for more details.
Sources: Pew Research Center analysis of Google Trends, accessed March 10, 2017, at 3:05 p.m. and Eurostat asylum application data, accessed May 17, 2017.
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Methodology

This report relies on data from Google Trends, a publicly available, web-based tool that permits users to explore online search volume by language and location over a specified time period. In this report, Google Trends is matched with migration data on refugee arrivals from the United Nations High Commissioner for Refugees (UNHCR) and asylum applications from Eurostat, the European Union's statistical agency. The data analysis in this report compares online searches with migration flows among Arabic-speaking (mainly Syrian and Iraqi) refugees from the Middle East to Europe in 2015 and 2016.

Online search data

Trends in online search data volume used in this report are based on data from Google Trends, a publicly available web-based tool that measures search volume of a specific search term across time, in specific languages and in specific countries. In this report, search term data are for the Arabic terms for "Greece" (searched in Turkey) and "German" (searched in Germany). Data were downloaded for the time span of Jan. 1, 2015 through Dec. 31, 2016, except for Google Trends showing hourly searches in March 2016.

Google is the most widely used search engine globally and is the top search engine used in Turkey and Germany. Google also is the search engine of choice in Syria and Iraq. Consequently, it is assumed that Google is the top search engine used by refugees coming from these countries.

Google standardizes online searches on a 0 to 100 scale for the time period selected by the user. Lower numbers indicate that terms were searched less frequently while higher numbers represent more frequently searched terms during the same time period. Google Trends data from Jan. 1, 2015 through Dec. 31, 2016, are in weekly estimates. These figures change slightly between downloads as they are a sample of searches.[9] To smooth out the variation, most charts in this report show monthly averages taken from weekly search volume.

Internet search data analysis like that available from Google Trends has limitations. Internet search data is an *indicator* of interest in a topic, not always resulting from or leading to actual behavior. Actual motivation for searches or behavior related to searches cannot be authenticated using Google Trends alone. When combined with migration data, however, internet search patterns can be linked to actual movement.

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[9] For more information on sampling of Google Trends, see the methodology of the Pew Research Center's report, "Searching for News: The Flint water crisis."

Narrowing in on Syrian and Iraqi refugees

The analysis in this report assumes that most Syrian and Iraqi refugees use Arabic as their primary search language on the internet. This assumption is important since Arabic is not widely spoken in Turkey (about 1% of the Turkish resident population speaks Arabic).[10] Consequently, sharp shifts in online searches are assumed to represent new Syrian and Iraqi arrivals and not other Arabic-speaking minorities within Turkey. To support this assumption, the Arabic term for "Greece" when searched in Turkey often occurred along coastal regions, places where Turkey's resident Arabic population are not located in large numbers. Syrian refugees were largely concentrated in these regions in 2015 and 2016, waiting to go to Europe via Greece or taking refuge from the Syrian civil war on the Turkish side of the Turkey-Syria border. Arabic searches for "Greece" also were high in areas where many refugee camps are located in Turkey.

It is possible that some searches for "Greece" in Arabic could come from Turkey's sizeable Kurdish population. However, searches for "Greece" in Arabic were not prominent in regions of Turkey where Kurdish is widely spoken. (The Kurdish population mostly resides in the southeastern region of Turkey). Nor does it appear that the small, non-refugee, Arabic-speaking population in Turkey was searching for "Greece" as a potential tourist location. If this had been the case, there most likely would have been upticks in online searches for "Greece" in the summer of 2016 or in earlier years, something that did not occur.

Arabic is also a minority language in Germany. This analysis assumes that fluctuations in Arabic searches largely represent the online searches of new refugee arrivals in Germany. Thousands of Syrians and Iraqis also settled in other European countries, including Hungary, Sweden and Austria. However, Google Trends data in Arabic were either unavailable for other European countries or when available, provided a less consistent direction in the trend.[11]

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[10] Arabic is the majority language of Syrians and Iraqis in their home countries, but only about 1% of the non-refugee population in Turkey speaks the language. Similarly, an estimated 0.5% (or about half a million) of Germany's population spoke Arabic prior the arrival of most Syrian and Iraqi refugees in 2015 and 2016, based on the number of foreign-born population from Arabic-speaking countries from United Nations migrant estimates for mid-year 2015.

[11] One exception was Sweden where the Arabic term for "Swedish" (ال سوي دي ة) tracked with first-time monthly asylum applications from Syrians and Iraqis. Sweden was not presented in the report because numbers of Syrian and Iraqi refugees to Sweden (about 80,000) were not as numerous as Germany (more than half a million).

Selecting the best search terms

Selection of the online search terms used in the analysis of this report do not rely on top search terms in Arabic in Turkey or Germany as Google does not publicly release top search terms by language. Instead, several terms that may be linked to migration were explored. These words include "smuggling," "asylum" and geographic destinations in Europe such as "Greece," "Germany" and "Sweden."

In many cases, geographic and migration terms were linked. For example the Arabic word – اليونان – for "Greece" among internet searches in Turkey was often searched with the Arabic word for "smuggling," according to Google Correlate, a tool that presents statistics on relationships between search terms. Within Turkey, "smuggling" in Arabic was also searched alongside "seek refuge," further supporting the notion that "Greece" was used alongside other search terms of potential migrants. And, it appears that these searches for assistance in migration from Turkey to Greece are unique to the Arabic language in Greece. Online search trends for "smuggling" and "asylum" in Turkish within Turkey, for example, did not show a similar trend for the same time period.

Searching for map terms like "Greece" for the purposes of migration is also consistent with a media report on Google search activity for Syrians within Syria in 2015 when "immigration to Germany," "asylum in Germany," "map of Europe," "Izmir" (primary coastal town in Turkey for departure to Greece) and "Greece" were listed as some of the top searches as the migration crisis in Europe began.

Analysis of the Arabic term for "Greece" in Turkey from Google AdWords shows that monthly search volume averaged 100 to 1,000 hits during 2015 and 2016, except for peak migration months between June and September of 2015 when "Greece" searches were between 1,000 and 10,000 monthly. This is a lower number of searches than actual number of people migrating each month from Turkey to Greece. A lower-than-expected number of searches for "Greece" each month suggests that Arabic-speaking internet users in Turkey were not searching for "Greece" out of curiosity or for news-related events.

The term "Greece" in Turkey was selected above other geographic terms because of its physical proximity for migration to Europe. Also, according to Google AdWords, "Greece" had a far greater number of monthly searches than other words like "smuggling" and "asylum" during the peak migration months. Consequently, it is assumed that "Greece" is less of an aspirational search, but a practical one for those searching for assistance with actual travel. The peak timing of such searches in the middle of the night is evidence for this assumption. At the same time, trends of the Turkish

word for "Greece" in Turkey were mostly flat for the same time period with single week peaks in July and November 2015. Again, this suggests the searching of "Greece" in Turkey is specific to Arabic speakers in Turkey.

At the same time, the Arabic term for "Greece" within Turkey appears to be intended for migration purposes and not part of broader Arabic searches for the same term worldwide. The Arabic term for "Greece" worldwide, for example, peaks for a single week in July 2015 and subsides within a few weeks.

Google searches for the term "Greece" in English as well as Turkish within Turkey also surged in a few occasions during 2015, presumably as English and Turkish speakers in Turkey were following the news of the refugee surge or events in Greece, such as the referendum, bailout and capital controls. These peaks in searches, however, only lasted for a week or two and were not as sustained as the same term in Arabic.

In Germany, the Arabic word – الألمانية – for "German" may indicate interest in learning the German language or performing online translation. Other terms in Arabic indicating transition into Germany society such as "integration course," "school," "jobs" were also examined, but showed less notable trends with the number of asylum applications. At the same time, there was no noticeable trend for the search term "German" in the German language in either Germany or worldwide. Also, there was no identifiable trend in Arabic searches for the Arabic word for "German" worldwide. This suggests that the trend observed in Arabic searchers for the word "German" in Germany is uniquely representative of Arabic speakers in Germany.

Migration data

Monthly migration data comes from two sources: (1) the United Nations High Commissioner for Refugees (UNHCR), for new arrivals into Greece and (2) Eurostat figures for first-time asylum applications for Germany. Since both Syrian and Iraqi asylum seekers have had fairly high acceptance rates in Europe, it is assumed that most Syrian and Iraqi migrants entering during 2015 and 2016 applied for asylum, and did not try to evade authorities.

Monthly arrivals by country of origin on Greece's shores from UNHCR since 2015 are unavailable. Consequently, comparisons of online searches with UNHCR data are for *all* refugee arrivals, not just Syrians and Iraqis. For 2015 and 2016 as a whole, however, nearly two-thirds (65%) of all sea arrivals into Greece recorded by UNHCR were Syrian and Iraqi citizens.

Every asylum seeker entering Europe, whether a child or an adult, must complete an asylum application. Data used in this report include only first-time asylum applicants, not those who have appealed an unsuccessful application. Although the European Union's digital system (EURODAC) seeks to minimize repeat applications across member states, some asylum applicants may have applications across multiple countries as refugees may move between European countries.

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