Global Cleft Lip and Palate Trips: A Google Trends Analysis

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Background

International cleft outreach trips from organizations such as Operation Smile have historically yielded positive benefits in providing reconstructive cleft care to communities with limited resources and infrastructure. In 2019, Operation Smile conducted 176 medical missions across 103 sites in 32 countries. Despite the impactful efforts employed to further improve care, assessing public demand and awareness in global cleft care remains a challenge for outreach organizations (Swanson et al., 2017; Murthy, 2019). This can significantly impact the effectiveness of resource allocation as underserved areas present increasingly high demand for cleft repairs.

Research Objectives

Online search data resources such as Google Trends (GT) enable plastic surgeons and international outreach organizations such as Operation Smile to longitudinally track global demand in cleft care. Using online search data resources such as GT enables plastic surgeons and international outreach organizations to better understand search demand for specific cleft-related terms. This data can help illustrate which locations have high demand for specific online search terms and can measure a relative degree of patient awareness for various aspects of cleft care. The purpose of this study is to use Google Trends' longitudinal data to help find effective locations for efforts in global outreach where patient awareness and demand for cleft lip and palate repair is increasing.

Methods

Google Trends:
- We utilized internet search query data from GT for the following terms: "cleft lip", "cleft palate", "cleft lip and palate," "cleft surgery", and "cleft repair" from January 2004 to January 2021. Frequency distributions were calculated, and countries and subregions were ranked based on interest. GT evaluates the interest of a specific search term and generates an indicator known as a relative search volume (RSV). This score illustrates the relative popularity of a term as a proportion of all Google search terms for a specific location and timeframe on a scale from 0 (no interest) to 100 (most interest).

Operation Smile:
- Longitudinal global data was collected from Operation Smile's website to review current global outreach of cleft care as measured by the sites visited and number of patients treated.

World Health Organization 2018 Global Reference List Indicators:
- Analyzed to access the current health infrastructure, national spending on healthcare, and healthcare coverage of countries identified from our Google Trends' results.

Table 1. Country and Subregion Analysis from GT

Country	"cleft lip"	"cleft palate"	"cleft lip and palate"	"cleft surgery"	"cleft repair"
Ghana	100	100	100	-	-
Accra	100	-	36		
Ashanti	80	100	33		
Central	-	-	100		
Philippines	64	80	35	100	100
Bicol	-	-	73		
Cagayan Valley	-	-	82		
Calabrazon	85	84	-		
Central Luzon	100	100	-		
Central Visayas	100	88	-		
Davao Region	-	82	-		
Eastern Visayas	-	-	80		
Metro Manilla	93	85	-		
Zamboanga Peninsula	-	-	100		
Nepal	78	61	-	-	-
Central Region	100	100			
Kenya	52	43	28		
Nairobi	100	100	100		
Pakistan	-	42	23	73	-
Punjab		100	-		
Sindh		77	100		
India	-	-	-	53	47
Nigeria	-	-	27	-	-
Oyo			100		
Zimbabwe	97	-	-	-	-
Harare	100				

Relative Search Volume (RSV) values from GT based on country and subregion with country. A value of 100 indicates the highest relative interest for a specific location relative to other locations.

Table 2. WHO Indicators and Operation Smile

Country	Health Facility Density & Distribution (per 100,000)	Health Worker Density & Distribution (per 100,000)	Amount Spent on Health as % of GDP	Coverage of Essential Health Services	Births Attended by Skilled Health Personnel	Postpartum Coverage for Women	Postnatal Care Coverage for Women	Number of Patients Treated by Operation Smile
Ghana	9.69	10.2	3.54	.56	78.1	81.1	23	550 (9 years)
Philippines	-	-	4.4	.49	84.4	71.96	86	26,400 (33 years)
Nepal	.72	-	5.84	.49	58	56.7	30	-
Kenya	5.99	10.7	5.17	.46	61.8	52.9	36	9,100 (since 1987)
Pakistan	.83	14.1	3.2	.5	69.3	60.38	64	-
India	-	27.5	3.54	.43	81.4	62.4	27	22,000 (13 years)
Nigeria	-	18.3	3.89	.49	43.3	37.1	14	-
Zimbabwe	10.59	12.7	4.73	.41	86	56.6	73	-

As WHO health indicators were utilized to validate the need to provide targeted outreach care to the identified countries, certain metrics justify the need to provide training and/or care. Countries such as Ghana, Kenya, India, Nigeria, and Zimbabwe with high health facilities and worker densities and distributions could be indicative of countries that have requisite infrastructure in place but could benefit from more focused training. Conversely, countries such as Nepal and Pakistan with low health facility densities and distributions may benefit from both direct cleft care for their patient populations along with training of local surgeons and staff.

Results

- Globally, the terms "cleft lip," "cleft palate," "cleft lip and palate", "cleft repair," and "cleft surgery" demonstrated an average increase of 35% in relative search volume between 2004 and 2021.
- For "cleft lip" the countries with the highest displaying RSVs included: Ghana (100%), Zimbabwe (97%), Nepal (78%), the Philippines (64%), and Kenya (52%). For "cleft palate", the list of countries with the highest search popularity included: Ghana (100%), the Philippines (80%) and Nepal (61%)
- Many regions within countries that were currently not receiving global outreach from global organizations. For example, after analyzing frequency distributions in Ghana which had very high search demand for all cleft related terms, we found the Ashanti region have the overall highest interest. However, when looking at the four regions currently being met with care from operation smile, the Ashanti region is not one of them. Another example can be found when looking at the Philippines. According to Operation Smile, over 26,000 patients were treated for CL/P in the Philippines over a period of 33 years in 73 cities. The subregions within the Philippines with the highest relative search volumes were Central Luzon and Central Visayas may aid outreach organizations in a more focused approach.

Relative Search Volume for "cleft lip" between 2004 and 2021

Relative Search Volume for "cleft palate" between 2004 and 2021
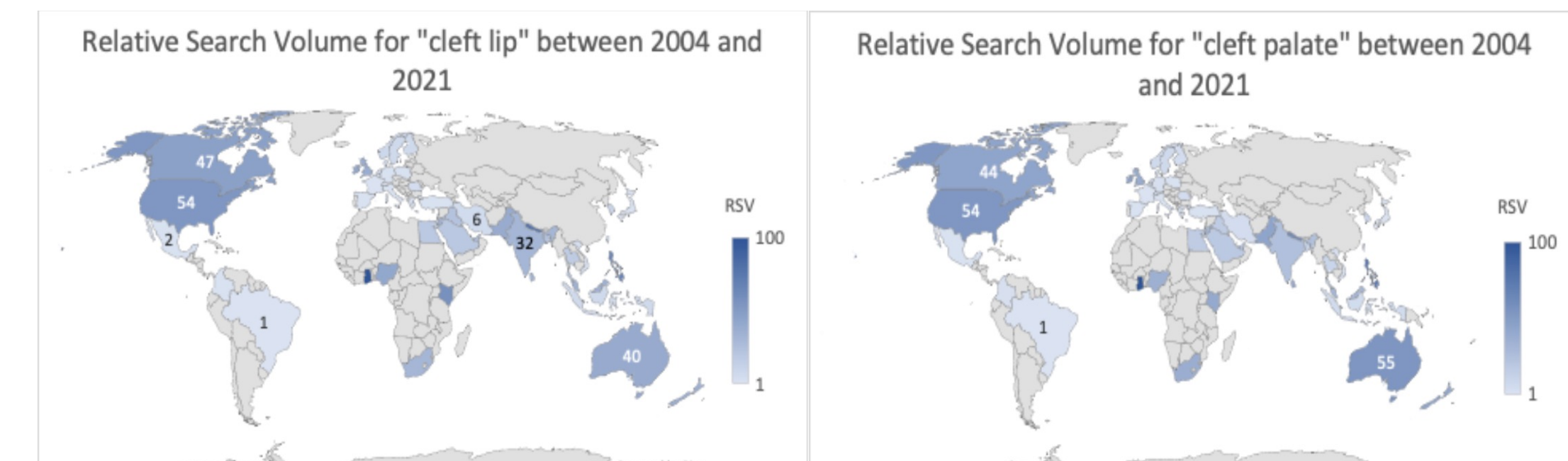
Conclusions

- Our findings illustrate the value of Google Trends as a supplementary tool regarding global outreach for cleft care.
- There exists many subregions within countries that have high search demand yet minimal global outreach presence.
- We describe a strategy that may be used to improve global outreach for patients, providers, and international organizations such as Operation Smile.
- By enhancing our understanding of patient demand based on relative search interest by country and subregion, we can better ensure that the **supply** of providers is matched to the **needs** of cleft patients