Do you Google? Your patients do.
What Dr. Google has been asked about HPV vaccines in the past 12 years.

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Disclosures

• No financial relationships or conflict of interest to disclose
Introduction

Parental decision-making process:
- Complex
- Not always evidence-based
  - We cannot rely on patient/parent literacy level

Use of different media sources
- Social Media
- Web
  - Youtube
- Journals and Magazines
- TV/Radio


Introduction
Introduction

Google algorithm
  > 200 variables

Suggestion of search engine *autocomplete* function
  different results for each computer
  different results for each user
  can influence users’ choice
HOT!

Is the HPV vaccine necessary?

Wow!

New Vaccine Recommendation Cuts Number Of HPV Shots Children Need

NEW
Objective

Investigate the publics’ internet demand for information about HPV vaccine in the past 12 years to better understand HPV vaccine decision-making process.

**Objective 1.** Describe top terms and trending terms through time periods

**Objective 2.** Identify differences between negative, neutral and positive terms

**Objective 3.** Analyse the relationship between search terms and time periods
Methods

Google Trends is a free tool, worldwide accessible that analysis.

Google search engine, the most used search engine worldwide.

Google Trends data is available from 2004 and can be analyzed by different time ranges, locations, topics, and categories.

https://www.google.com/trends/
HPV Vaccines

- HPV
- Human Papillomavirus
- VPH (French)
- ...

Top terms

Trending terms
Methods

Statistical Analysis

**Objective 1.** Descriptive statistic
**Objective 2.** Qui-square
**Objective 3.** Logistic Regression
Table 1. Google trends analysis of HPV Vaccines related terms from 2005 until 2016.

<table>
<thead>
<tr>
<th>Time</th>
<th>Negative</th>
<th>Neutral</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-2008</td>
<td>19 (3.3%)</td>
<td>534 (92.9%)</td>
<td>22 (3.8%)</td>
</tr>
<tr>
<td>2009-2012</td>
<td>108 (17.1%)</td>
<td>492 (78.1%)</td>
<td>30 (4.8%)</td>
</tr>
<tr>
<td>2013-2016</td>
<td>252 (41.8%)</td>
<td>341 (56.5%)</td>
<td>10 (1.7%)</td>
</tr>
</tbody>
</table>

Mean = 21%  Mean = 75.8%  Mean = 3.4%

p < 0.0001

<table>
<thead>
<tr>
<th>Time</th>
<th>Negative</th>
<th>Neutral</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-2008</td>
<td>6 (1.0%)</td>
<td>558 (97.0%)</td>
<td>11 (1.9%)</td>
</tr>
<tr>
<td>2009-2012</td>
<td>6 (0.9%)</td>
<td>623 (98.9%)</td>
<td>1 (0.2%)</td>
</tr>
<tr>
<td>2013-2016</td>
<td>6 (1.0%)</td>
<td>596 (98.8%)</td>
<td>1 (0.2%)</td>
</tr>
</tbody>
</table>

Mean = 1%  Mean = 98.2%  Mean = 2.3%

p = 0.002
### Trending terms

<table>
<thead>
<tr>
<th>Negative terms 2005-2008 vs Positive terms 2005-2008</th>
<th>OR</th>
<th>CI 95%</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.7</td>
<td>1.0-13.4</td>
<td>0.048</td>
</tr>
</tbody>
</table>

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<thead>
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<th>Negative terms 2009-2012 vs Positive terms 2009-2012</th>
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<tr>
<td></td>
<td>1.3</td>
<td>0.5-3.9</td>
<td>0.578</td>
</tr>
</tbody>
</table>

<table>
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</thead>
<tbody>
<tr>
<td></td>
<td>&gt;1000</td>
<td>∞</td>
<td>&lt;0.001</td>
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<td>0.999</td>
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<table>
<thead>
<tr>
<th>Neutral terms 2005-2008 vs Neutral terms 2013-2016</th>
<th>OR</th>
<th>CI 95%</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5</td>
<td>0.4-0.7</td>
<td>0.939</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positive terms 2005-2008 vs Positive terms 2013-2016</th>
<th>OR</th>
<th>CI 95%</th>
<th>p value</th>
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</thead>
<tbody>
<tr>
<td></td>
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### Top Terms

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<th>p value</th>
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<tr>
<td></td>
<td>0.999</td>
<td>0.999</td>
<td>&lt;0.001</td>
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**TRENDING TERMS**
- Significant differences between negative and positive trends every time period.
- Significant differences in the distribution of negative, neutral and positive trends between the first and recent years.

**TOP TERMS**
- Positive Terms significantly lowering through time.
Discussion

TOP TERMS
- Stable / Less affected
- Lower influence
- More neutral

TRENDING TERMS
- Tendencies
- High influence
- Negative influence increasing
Discussion

• If we reconsider the *cervical cancer*, *cervical cancer screening* and the *regulatory searches* as « neutral », we do not have any « positive » terms left, only « negative »

• We can’t control what people will search on the internet, but it can be used to guide us for better interventions
Discussion

• Some related terms are embedded in the topics as expected (e.g. side effects, parental issues)

• Misinformation in news report
  • Damage by itself
  • Corrections do not completely reverse the initial effect


Discussion

• Cervical Cancer Prevention agencies and organizations should aim for the power that *celebrities’ statements* have on trending terms related to HPV Vaccine

  • *celebrities’ statements* appears trending only between “negative” searches, not “positive”, neither “neutral” searches

  • General public tend to follow advice of celebrities
  
  • Partnering with celebrities

Conclusions

Special attention should be given to the impact of celebrities’ statements, as negative searches have been trending.

Public opinion is being led by non-evidence-based discourse.

Google Trends can be used to analyze and monitor information demands trends on HPV vaccine.
Recommendation

Do not see media as the enemy, but as a potential "battlefield" to shorten communication gaps between general public and science.

"Battlefied" term was an inspiration from Stahl, 2016.
Thank You

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