

#Gardasil on Twitter

AN EXPLORATORY STUDY EXAMINING CONTENT AND SOURCE
CHARACTERISTICS OF HPV VACCINE-RELATED TWEETS

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HPV 101 (CDC, 2013)

- **Genital human papillomavirus (HPV) is the most common sexually transmitted virus in the U.S.**
- **More than half of sexually active men and women are infected with HPV at some time in their lives.**
- About 20 million Americans are currently infected, and about 6 million more get infected each year. An estimated 74% of new HPV cases occur in 15 to 24 year olds.
- Most HPV infections don't cause any symptoms, and go away on their own. But **HPV can cause cervical cancer in women. Cervical cancer is the 2nd leading cause of cancer deaths among women around the world.** In the U.S., about 12,000 women get cervical cancer every year and about 4,000 are expected to die from it.
- HPV is also associated with several less common cancers, such as vaginal and vulvar cancers in women, and anal and oropharyngeal cancers in both men and women. HPV can also cause genital warts and warts in the throat.
- There is no cure for HPV infection, but some of the problems it causes can be treated.

HPV 101 (Villa et al, 2005; Merck, 2011; Goldstone et al, 2013)

- There are ~30-40 types of HPV that can affect the genital area.
- HPV types 16 and 18 cause about 75% of cervical cancer cases, 70% of vaginal cancer cases, and up to 50% of vulvar cancer cases in females.
 - HPV-associated cancers in males include certain anal, penile, and oropharyngeal and oral cavity cancers caused primarily by HPV 16.
- HPV types 6 and 11 cause about 90% of genital warts cases in males and females.

The HPV Vaccine (Merck, 2011)

- Gardasil is one of two vaccines that can be given to prevent HPV, and it is approved for both males and females ages 9 to 26.
- Gardasil is the only HPV vaccine that helps protect against 4 types of HPV:
 - 16 and 18 (related to cervical cancer)
 - 6 and 11 (related to genital warts)
- Protection from HPV vaccine is expected to be long-lasting. But vaccination is not a substitute for cervical cancer screening. Women should still get regular Pap tests.

The HPV Vaccine (CDC, 2013)

- HPV vaccine is given as a 3-dose series
 - 1st Dose - Now
 - 2nd Dose - 1 to 2 months after Dose 1
 - 3rd Dose - 6 months after Dose 1
- Additional (booster) doses are not recommended
- This HPV vaccine is recommended for girls and boys 11 or 12 years of age. It may be given starting at age 9.
- Why is HPV vaccine recommended at 11 or 12 years of age?
 - HPV infection is easily acquired, even with only one sex partner. That is why it is important to get HPV vaccine before any sexual contact takes place. Also, response to the vaccine is better at this age than at older ages.
- Within 4 years of vaccine introduction, the vaccine-type HPV prevalence decreased among females aged 14–19 years (Markowitz et al, 2013)

The Controversy

- **HPV is a sexually transmitted virus** (Haber et al, 2007)
 - The HPV vaccine prevents an infection that is transmitted only by sexual contact, differentiating it from all other compulsory vaccines, which prevent infections that are easily transmitted in a school setting
- **Low cervical cancer prevalence in the U.S.**
- **There is a large anti-vaccine segment in the U.S.** (Haber et al, 2007)
 - Giving 11 and 12 year old girls this vaccine implies a tacit consent to engage in sexual activity
 - Will give young people a false sense of protection from STIs and will lead to sexual disinhibition characterized by earlier engagement in sexual intercourse
 - Children already have too many vaccinations on the immunization schedule
 - The vaccine is not safe
 - Long-term side effects are unknown
- **Accordingly, vaccine uptake is very low and especially in key priority populations!** (Krishnan, 2008)

Proposed Study

The purpose of this study is to:

1. Examine the content of tweets regarding the HPV vaccine, including information accuracy (and misinformation);
2. Assess the general sentiment toward the HPV vaccine on Twitter;
3. Describe any geographic differences in 1 and 2 above; and
4. Identify any “influential tweeters” and assess their interest in participating in future research regarding HPV vaccine promotion on Twitter.

Methods

- Time-frame
 - September 11, 2014 - ???
- Keywords
 - HPV and vaccine
 - Gardasil
 - “cervical cancer” and vaccine
- Procedure
 - <http://vision.sdsu.edu/tweetmap/>
- Analysis

Preliminary Results

- Time-frame
 - September 11, 2014 – October 30, 2014 (~7 weeks) = **3,115 (possibly duplicated) tweets**
- Keywords
 - HPV and vaccine = **1,931 tweets** (Washington, DC = 446)
 - Gardasil = **958 tweets** (Washington, DC = 356)
 - “cervical cancer” and vaccine = **226 tweets** (New York/Jersey City/Newark = 74)

Proposed Analyses

- Data collection to continue until???
- Clean data (Yoon et al, 2013)
 - Text cleaning
 - Text transformation
 - Attribute selection/dimensionality reduction
 - Retweets
- Develop coding guide
 - Source characteristics: Type of tweeter (e.g., individual, agency), location, potential influence (e.g., # of followers/friends), volume of tweets, **other user characteristics?**
 - Content characteristics: Content type of tweet (e.g., research findings, news story, personal account), tweet categorization, content type of URL, retweet?

Proposed Analyses

- Descriptive statistics and visualizations of tweet topics
- Examine sentiment of tweets
 - More positive vs. more negative
 - Based on U.S. Census regions (https://www.census.gov/geo/maps-data/maps/pdfs/reference/us_regdiv.pdf) and perhaps by state
- Assess accuracy of content (or misinformation) in a random sample of tweets

Significance and Next Steps

- If we can understand what is being discussed on Twitter regarding the HPV vaccine, including information accuracy (or misinformation), as well as the general sentiment toward the HPV vaccine and any geographic differences in messages, then we can start thinking about developing HPV vaccine promotion strategies and messaging for social media.
- If we can identify any “influential tweeters” and assess their interest in participating in future research regarding HPV vaccine promotion on Twitter, then we may have a delivery mechanism and future project.

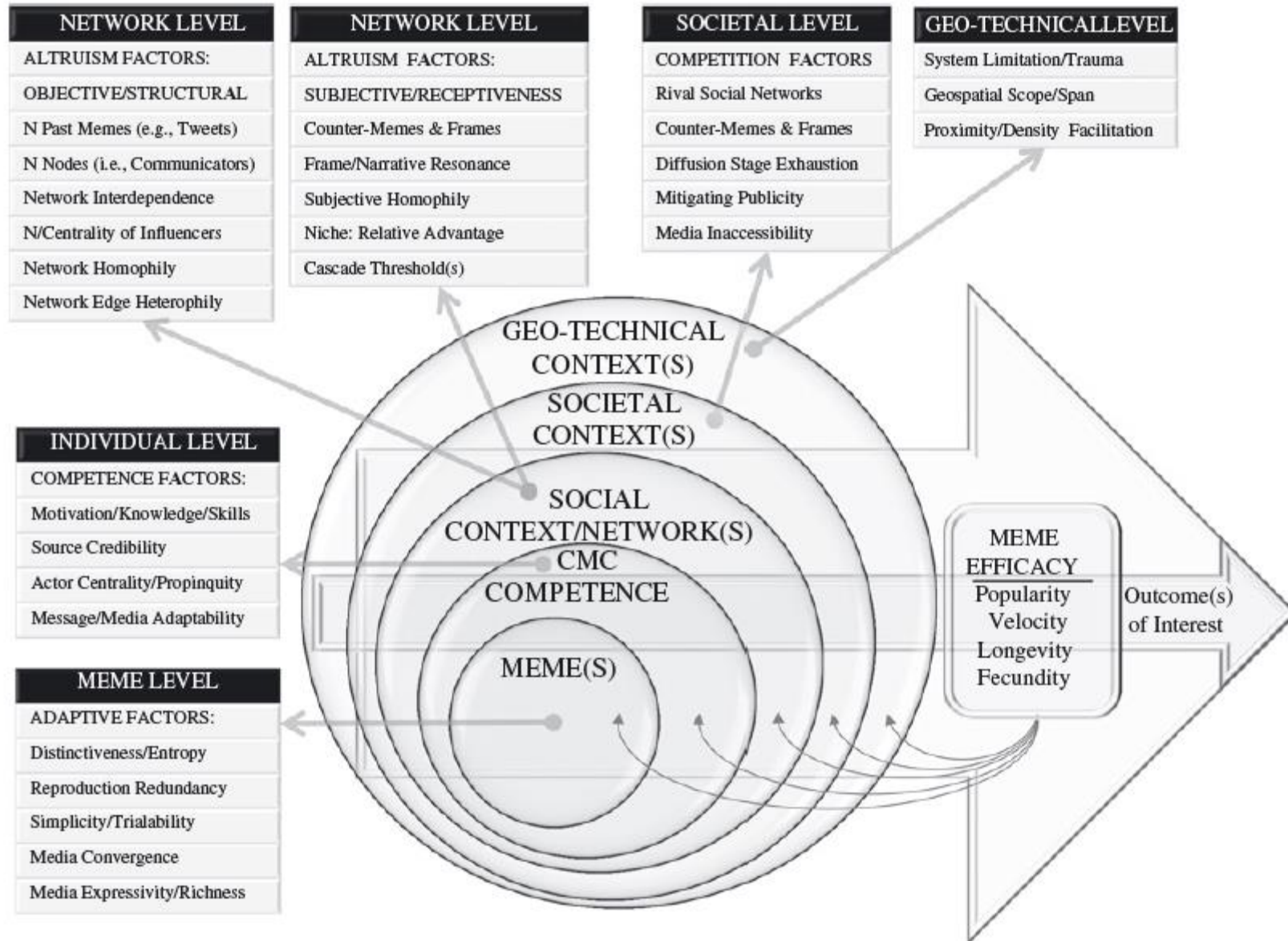


Figure 1 The multilevel model of meme diffusion (M³D).

Spitzberg, B. H. (2014). Toward A Model of Meme Diffusion (M³D). *Communication Theory*, 24(3). 311–339. DOI: 10.1111/comt.120

Thank you! Thoughts and Questions?

CDC. (2013). Vaccine Information Statement: HPV Vaccine Gardasil. Retrieved from <http://www.cdc.gov/vaccines/hcp/vis/vis-statements/hpv-gardasil.pdf>

Goldstone, S. E., Jessen, H., Palefsky, J. M., Giuliano, A. R., Moreira, E. D., Vardas, E., ... Garner, E. (2013). Quadrivalent HPV vaccine efficacy against disease related to vaccine and non-vaccine HPV types in males. *Vaccine, 31*(37), 3849–55. doi:10.1016/j.vaccine.2013.06.057

Haber, G., Malow, R. M., & Zimet, G. D. (2007). The HPV vaccine mandate controversy. *Journal of Pediatric and Adolescent Gynecology, 20*(6), 325–31. doi:10.1016/j.jpag.2007.03.101

Markowitz, L. E., Hariri, S., Lin, C., Dunne, E. F., Steinau, M., McQuillan, G., & Unger, E. R. (2013). Reduction in human papillomavirus (HPV) prevalence among young women following HPV vaccine introduction in the United States, National Health and Nutrition Examination Surveys, 2003-2010. *The Journal of Infectious Diseases, 208*(3), 385–393. doi:10.1093/infdis/jit192

Merck. (2011). Patient Information about GARDASIL®. Retrieved from http://www.merck.com/product/usa/pi_circulars/g/gardasil/gardasil_ppi.pdf

Villa, L. L., Costa, R. L. R., Petta, C. a, Andrade, R. P., Ault, K. a, Giuliano, A. R., ... Barr, E. (2005). Prophylactic quadrivalent human papillomavirus (types 6, 11, 16, and 18) L1 virus-like particle vaccine in young women: A randomised double-blind placebo-controlled multicentre phase II efficacy trial. *The Lancet. Oncology, 6*(5), 271–8. doi:10.1016/S1470-2045(05)70101-7

Yoon, S., Elhadad, N., & Bakken, S. (2013). A practical approach for content mining of Tweets. *American Journal of Preventive Medicine, 45*(1), 122–129. doi:10.1016/j.amepre.2013.02.025

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