Using Social Media and Technology to Spread Awareness, Educate Patients, and Increase Vaccine Compliance

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Background

Immunizations are the cornerstone of effective preventative care in the modern world. Proper vaccination has resulted in drastically reducing morbidity and mortality associated with infectious diseases. The consequences associated with failing to vaccinate from an early age take an enormous toll both on quality of human life as well as health care costs.[1] In addition to an increased number imported cases of vaccine preventable illness, a higher proportion of those dependent on herd immunity are losing protection due to a lack of vaccine compliance.[2] Despite extensive efforts to increase awareness of the benefits of vaccination, integrative approaches to accommodate vaccination are few and far in between. Even for those with access to care, disjointed primary care can often result in difficulty maintaining compliance with recommended vaccination schedules. With a number of vaccine and booster requirements for each individual, parents and guardians are challenged with maintaining proper compliance for their dependents as well as themselves. In addition, public support towards preventative vaccines has declined in recent years.

With the additional surge in social media and online profiles, linking health records to secured social media accounts may be a significant tool in educating and empowering community members in taking charge of health practices such as vaccine compliance.

Objectives

Our team, consisting of medical, public health and computer science students from 3 institutions, set out to design a system that would allow for the following:

- **Provides an effective, efficient, and equitable way for parents to schedule and obtain their family's vaccinations**
- **Provides information and guidance in obtaining those vaccinations**
- **Educates users about the risks and benefits of vaccines and their associated diseases**
- **Stores vaccination records in one cohesive database**
- **Empowers users to take charge of their own community's health**

Methods

The website , interface and database designed were dubbed "**VaxNation.**"
The VaxNation website is coded in HTML and PHP, using a MySQL database, and is hosted on a private dedicated server. The use of a central server allows access from a variety of interfaces, including mobile phones, browsers, and tablets. JQuery features such as dialog boxes and charts are utilized to improve the user experience.

Site Optimizations
The database was organized to ensure 3NF, minimizing redundancy and dependency of data to ultimately ensure fast queries when accessing vaccine records, storing information, and computing schedules. The website is delivered through a content delivery network to facilitate fast load times with scalability considerations. A Google mail server is used to maximize alert delivery speed and is able to handle sending out a large volume of alerts quickly.

Vaccine Schedules
The extensible admin interface was designed to allow a non-technical administrator to input schedules for vaccines and consider restrictions such as:
- Minimum and maximum wait times between doses
- General vaccine age restrictions
- Absolute vaccine age restrictions

Vaccine schedules can be easily updated to reflect CDC changes and new vaccines or updated schedules can be added in a matter of minutes.

Data
All vaccination statistics are obtained dynamically through the Health Indicators Warehouse API. When inputting immunization schedules, administrators can add indicators associated with the vaccine to display relevant statistics to users. These include vaccination rates for individual vaccines and the percent of children fully vaccinated. VaxNation will automatically search for the most relevant data available, such as at the state or county level based on the user's IP address, when displaying the information to the user.

Social Media
VaxNation is integrated with Facebook. Users can authenticate on the website using their Facebook accounts, and statistics seen on the site can be shared and promoted through Facebook. Each statistic shared through Facebook is tagged with a referral code which allows users to track clicks on the links they share. National referral maps, local and global leaderboards, as well as future contests are some of the features included on the site to promote a viral education on the importance of immunizations.

Table 2. VaxNation Usage Stats (May 2012 – Sept 2012)

Total registered members:	62
Total visit to VaxNation:	1,658
Total unique visitors:	1,239
Page views:	5,591
Average pages/visit:	3.37
Average visit duration:	3 min and 9 sec
Number of US states visited VaxNation:	48 of 50 (none from Alaska or Oklahoma)
Number of countries Visiting VaxNation:	38

Combating Misconceptions & Educating Users

Due to the growing anti-vaccination movement there have been more recent preventable deaths among children and endemics of diseases thought to be eliminated for decades. VaxNation's aims to change immunization perception in the community to propel healthy behavior and self affinity. VaxNation connects directly to social media (such as Facebook and Twitter), allowing users to educate and empower their friends, families, and communities, encouraging a viral effort towards the control of infectious disease.
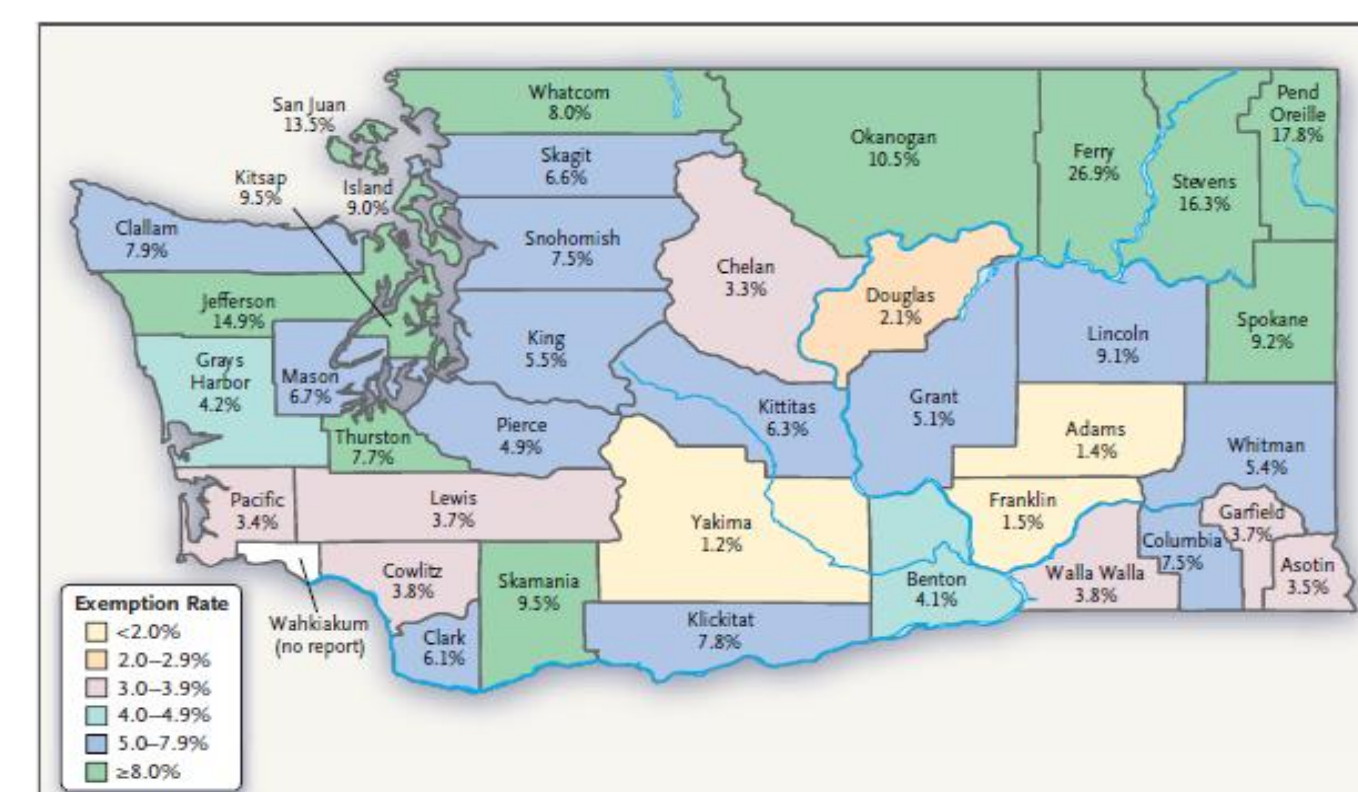
Figure 1: Rates of Exemption from Vaccination for Nonmedical Reasons in Washington Counties, 2006–2007. Data are from the Washington State Department of Health, School Status Reports, 2006–2007. **Source:** Omer SB, Salmon DA, Orenstein WA, deHart MP, Halsey N. Vaccine refusal, mandatory immunization, and the risks of vaccine-preventable diseases. N Engl J Med 2009; 360:1981–8.
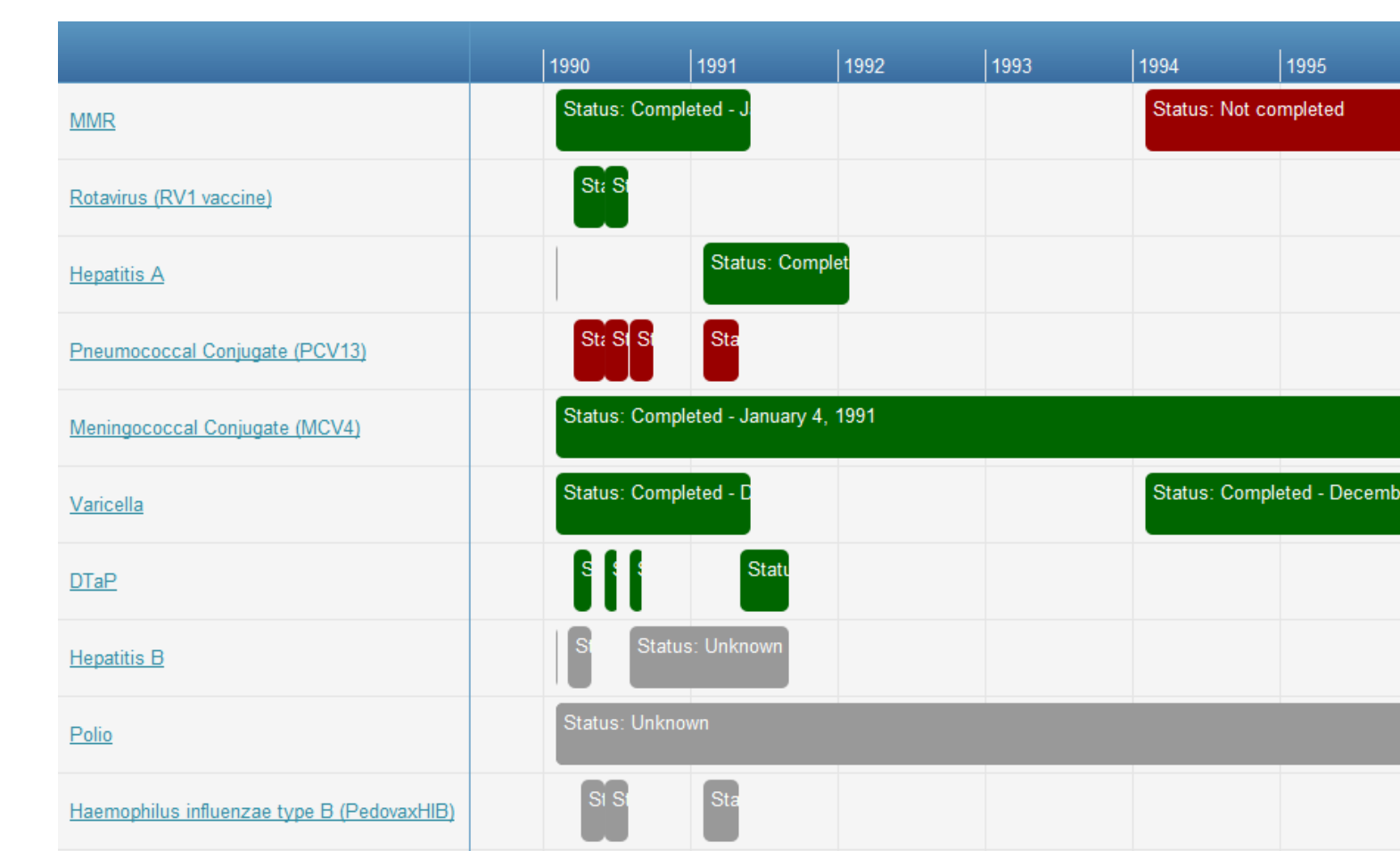

Figure 3. VaxTracker Sample of the interface users can access to track their immunization progress, access their records, and plan future doses.

Future Developments

The VaxNation project is refining several aspects of the system including:
- Improved User Interface
- Clinic Locator using National Registry of Clinics
- Scheduling support for Additional Adult Vaccines, New Vaccines, and Seasonal/Outbreak Vaccines
- Incorporating Travel Vaccines
- WHO standards to assist in International Vaccine Coordination

VaxNation aims to save time for families while also decreasing clinic traffic, and making vaccinations more efficient in the developing world. For systems transitioning to electronic records especially, VaxNation hopes to assist in vaccine coordination and develop a robust system to assist in coordinating immunization services.

References available on request.