



Brief report

Internet activity as a proxy for vaccination compliance

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ABSTRACT

Tracking the progress of vaccination campaigns is a challenging and important public health need. Examining a recent Polio outbreak in the Middle East, we show that novel methods utilizing online search trends have great potential to provide a real-time, reliable proxy for vaccination rates over space and time.

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1. Introduction

Population-scale vaccination programs are essential for controlling disease outbreaks, yet health officials often lack the real-time information on compliance necessary for guiding ongoing efforts and assessing the success of vaccination campaigns [1,2]. Without this knowledge, precious time is often lost as high-priority populations fail to be sufficiently vaccinated while the disease spreads.

Current methods for tracking vaccinations typically rely on manual public health reporting or ad-hoc surveys [3], requiring the aggregation of different data sources and involving significant delays. For example, tracking of flu vaccination rates in the United States relies on the integrated evaluation of six different surveys administered nationally [4], and can lag behind by as much as two to four years [5]. New approaches are needed to complement existing reporting methods and enable a more effective utilization of limited healthcare resources [6].

One potential new approach involves the use of online data from internet query share (IQS) statistics [7]. IQS data measure the popularity of different search terms over different

geographical regions and time periods using web resources such as Google Trends, Wikipedia, Twitter, and others. While the use of IQS data has gained popularity in healthcare studies in recent years, its utility for tracking vaccination campaigns has yet to be measured. The geographical resolution of IQS data can help pinpoint specific areas with low compliance in vaccination campaigns, while the timeliness of IQS data allows rapid response to changes in compliance. IQS data are freely available and can thus minimize the costs required for tracking population-level vaccination compliance, especially in areas where public Internet access is available but health-reporting systems are not electronically integrated.

A recent Polio outbreak in Israel serves as an ideal natural experiment for evaluating the use of such new approaches for vaccination monitoring [8]. In June 2013, poliovirus was detected in the sewage system in southern Israel, and tracked to Bedouin residents living in the region. In response, oral polio vaccine (OPV) was immediately administered to nearby communities. Two months later, in August 2013, a nation-wide vaccination campaign named “Two Drops” was launched. The aim of the campaign was to vaccinate all children who were born after January 1, 2004 (zero to nine years old) with the live attenuated oral polio vaccine (OPV). During the “Two Drops” campaign, a total of 976,756 children were vaccinated out of a total of 1383,296 children targeted (64.8% vaccination coverage). The vaccinations were administered at 1015 Family Health Centers across the nation, operated by either the Israeli Ministry of Health, one of the four national Health Maintenance Organizations (HMOs), or one of the local municipalities [9].

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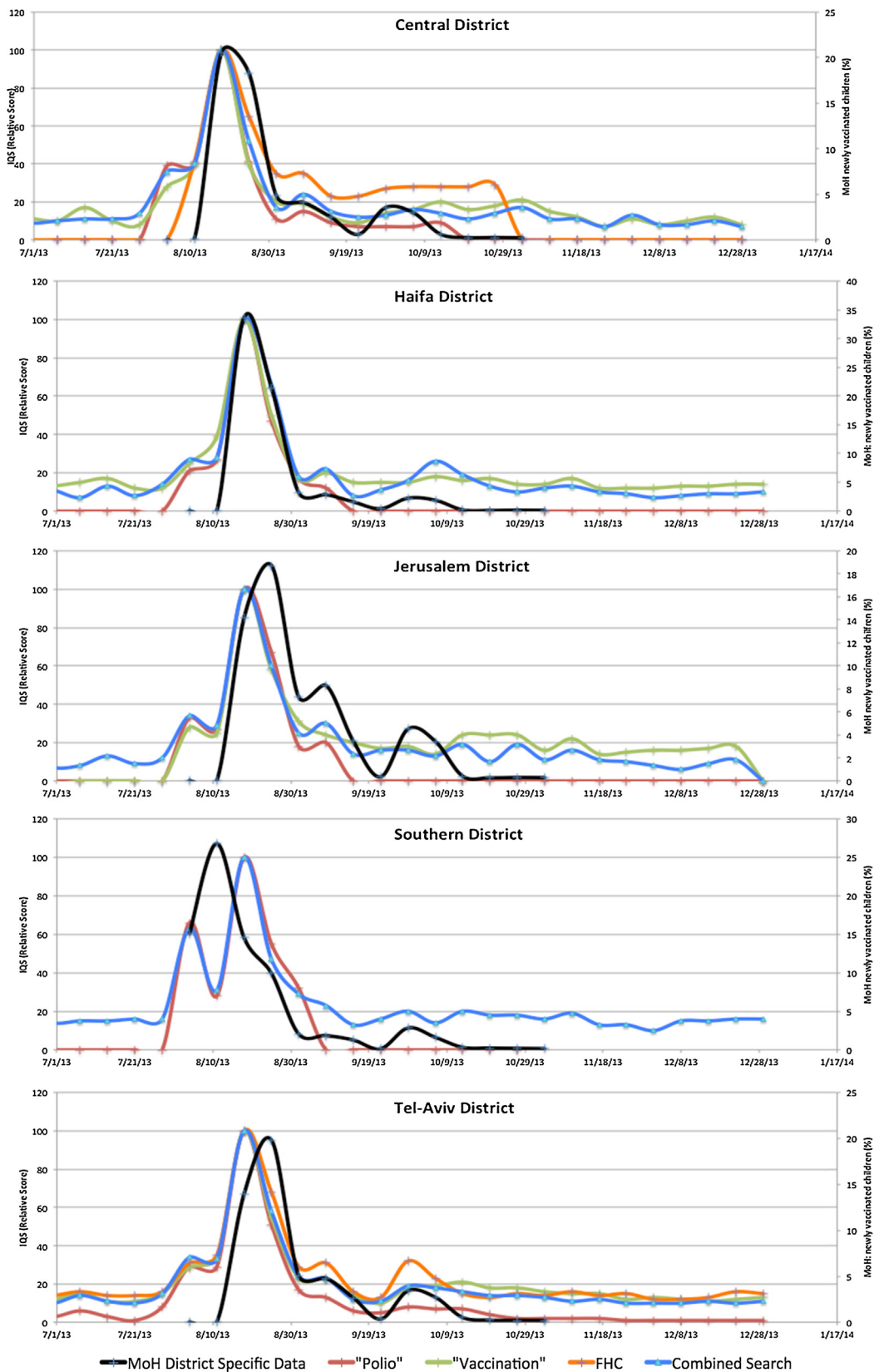


Fig. 1. District level data. Comparing IQS results for "polio", "vaccination(s)", "Family Health Center(s)" (FHC) and a combined query of any of these terms, with data obtained from the MOH. Northern district not shown due to insufficient IQS data.

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