

Contents lists available at [ScienceDirect](#)

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Impact of community-delivered SMS alerts on dog-owner participation during a mass rabies vaccination campaign, Haiti 2017 [☆]

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ARTICLE INFO

Article history:

Received 3 January 2018

Received in revised form 2 March 2018

Accepted 6 March 2018

Available online xxxxx

Keywords:

Rabies

Vaccination campaign

SMS

Text message

mHealth

ABSTRACT

Haiti has historically vaccinated between 100,000 and 300,000 dogs annually against rabies, however national authorities have not been able to reach and maintain the 70% coverage required to eliminate the canine rabies virus variant. Haiti conducts massive dog vaccination campaigns on an annual basis and utilizes both central point and door-to-door methods. These methods require that dog owners are aware of the dates and locations of the campaign. To improve this awareness among dog owners, 600,000 text messages were sent to phones in two Haitian communes (Gonaives and Saint-Marc) to remind dog owners to attend the campaign. Text messages were delivered on the second day and at the mid-point of the campaign. A post-campaign household survey was conducted to assess dog owner's perception of the text messages and the impact on their participation in the vaccination campaign. Overall, 147 of 160 (91.9%) text-receiving dog owners indicated the text was helpful, and 162 of 187 (86.6%) responding dog owners said they would like to receive text reminders during future rabies vaccination campaigns. In areas hosting one-day central point campaigns, dog owners who received the text were 2.0 (95% CI 1.1, 3.6) times more likely to have participated in the campaign (73.1% attendance among those who received the text vs 36.4% among those who did not). In areas incorporating door-to-door vaccination over multiple days there was no significant difference in participation between dog owners who did and did not receive a text. Text message reminders were well-received and significantly improved campaign attendance, indicating that short message service (SMS) alerts may be a successful strategy in low resource areas with large free roaming dog populations.

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1. Introduction

Rabies is a neglected disease that causes human deaths in more than 150 countries worldwide and is primarily spread through the bite of a rabid dog [1]. Those living in poverty and children are over-represented amongst the 59,000 rabies deaths that occur each

year [2]. Despite rabies' notoriety as the deadliest infectious disease in the world, a lack of surveillance and under-utilized or poorly implemented dog vaccination campaigns have hindered global control efforts [3]. Recently local success stories have been reported from programs in Guatemala, Haiti, India and Malawi, with assistance from the Centers for Disease Control and Prevention (CDC), Mission Rabies, and the Pan American Health Organization (PAHO) [4–7]. However, these successes have involved significant staff training and technology incorporation; logistical constraints that cannot be easily replicated in all 122 canine-rabies endemic countries.

While expanding their annual campaigns, Haiti has struggled to improve their vaccination coverages above 45%, and CDC, Christian

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<https://doi.org/10.1016/j.vaccine.2018.03.017>

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Please cite this article in press as: Cleaton JM et al. Impact of community-delivered SMS alerts on dog-owner participation during a mass rabies vaccination campaign, Haiti 2017. Vaccine (2018), <https://doi.org/10.1016/j.vaccine.2018.03.017>



Fig. 1. Text message received by community member during Haiti's mass dog rabies vaccination campaign, 2017. Translates to: "Attention! From May 21 to June 3, the Ministry of Agriculture will vaccinate all dogs in the city of Saint-Marc and Gonaives for free. Take your dogs to vaccinate at the nearest post, to protect yourself and the entire population."

Veterinary Mission (CVM), Haiti Ministry of Agriculture (MARNDR), Mission Rabies, and PAHO are collaborating to develop novel methods to improve vaccination coverages [7]. Generating sufficient public awareness of vaccination campaigns in low-resource settings can be difficult, as access to TV, radio, and printed media are not routinely available [8]. This is also true in Haiti, where the primary method of vaccination campaign awareness involves megaphone announcements from vehicles several days prior to the campaign, as well as hand-held megaphone announcements by vaccinators on the day of vaccination. In order to overcome this deficiency in public awareness, an option raised in discussion with the stakeholders and Merck Animal Health (known as MSD Animal Health outside of the United States and Canada) was to explore the use of mobile technology.

An estimated 85% of the global adult population owns a cell phone, meaning that in even the least developed countries, cellular data service and familiarity with mobile applications are commonplace [9]. An estimated 62% of all Haitians (92% of adults) have mobile phone subscriptions across four major providers [10]. Mobile technology is increasingly evolving to the benefit of public health systems, with recent advances in patient monitoring, health alerts, and disease surveillance [11]. While a review of short message service (SMS) applications in disease prevention noted that very few programs had evaluated the effect of their messages, they have qualitatively reported that beneficiaries found them helpful [12]. mHealth, the use of mobile devices in medicine and public health, has brought recent successes to rabies prevention through vaccination campaign management and bite victim SMS reminders [5,13]. Therefore, in 2017, CDC, CVM, MARNDR, Merck Animal

Health, Mission Rabies, and PAHO developed a program to test the impact of a text-based dog vaccination reminder during a mass vaccination campaign in two Haitian communes: Gonaives and Saint-Marc in the Artibonite Department.

2. Methodology

The evaluation of the impact of text message reminders on vaccination campaign participation was nested within a larger evaluation of vaccination methodology conducted in Haiti during their 2017 mass dog vaccination campaign. Two vaccination methods were applied in two urban communes (Gonaives and Saint-Marc): a typical campaign that spent 1-day in each vaccination zone in North Saint-Marc and North Gonaives and a mobile application-assisted campaign that spent up to 3 days in each vaccination zone in South Saint-Marc and South Gonaives. The cities were divided along major roadways to help vaccinators find the correct area; there were no significant differences in geological features, population density, or rabies vaccination history. Rabies vaccinators conducted a mixed methodology, in which fixed point vaccination was conducted until participation dropped below 25 dogs per hour, after which vaccination teams switched to door-to-door vaccination. Dog vaccination was conducted 6 days per week over a 17-day period (May 20 – June 5, 2017).

Merck Animal Health, with assistance from CVM, purchased 600,000 text messages from a major cellular network provider for \$10,000 (\$0.015 per message). Text messages were delivered to phones with SIM cards purchased in Gonaives and Saint-Marc, regardless of their location within high or low intensity vaccination zones. The text message notified residents of the free rabies vaccination campaign and encouraged them to participate (Fig. 1). On the second day of the campaign, 300,000 texts were delivered. An additional 300,000 were sent at the beginning of the second week of vaccination. Announcers on trucks drove through communities one week before and the night before the campaign. Vaccinators placed wax marks on the forehead of vaccinated dogs, as well as cotton-mesh collars.

Twenty-three of the 231 zones within the communes were randomly selected for post-vaccination coverage assessment, utilizing both household and sight-resight surveys: North Saint-Marc ($n = 4$), South Saint-Marc ($n = 4$), North Gonaives ($n = 7$), South Gonaives ($n = 8$). The sample size to determine post-vaccination coverage was calculated based on a human population of 292,000, dog ownership rate of 50%, an $\alpha = 0.05$, a design effect of 1.5, and a 10% nonresponse rate. The total number of households to survey was calculated at 634. Interviewers selected a random location within each zone and attempted to interview every other household along a contiguous path until at least 28 households had been interviewed. Surveys were conducted by two surveyors per zone over one to three consecutive days, initiated within 3 days of the vaccination program leaving the area. Sight-resight surveys recorded all dogs seen along paths in each zone, noting the presence of a vaccination mark (wax, collar, or both) to obtain the free-roaming dog vaccination coverage.

To assess campaign awareness and timing of announcement methods, surveyors asked four questions as part of the post-campaign survey (Boxes 1 and 2). A further line of questioning ascertained whether the respondent's household owned dogs, and if they had brought the dogs to the campaign. The surveyors read the questions and answer options to the interview subjects and recorded their selections. The data were collected in the Mission Rabies application, cleaned in Microsoft Excel®, and analyzed in OpenEpi version 3.01 to calculate risk ratios, 95% confidence intervals, and mid-p exact two-tailed probability values.

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