TCV Vaccination Status

Chris LeBoa

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## Evaluating Vaccination Status within the Navi Mumbai Project

In the Navi Mumbai TCV project our team has planned to to a test negaitve design for evaluating the impact of the TCV vaccination.

(For more information on this design please see the analysis plan also attached to this email)

This analysis relies on using a participant’s (who sought healthcare at a surveillance site and had fever for >3 days) phase and vaccine status as exposures and typhi blood culture results as the outcome.

However, the populations seeking healthcare and the study’s method for determining vaccination may render our analysis population as a different population than the general population of phase 1 and phase 2 areas. The study went back to case households to determine type of vaccine through the vaccine effectiveness questionnaire, but staff did not follow up with participants who tested blood culture negative. This may disproportionately undercount the percentage of blood culture negative individuals who have received a typhi vaccine.

**This script is meant to answer the following questions:**

What proportion of the overall Navi Mumbai eligible population report getting a TCV Vaccine?

Of those who meet the enrollment definition, what proportion report getting a TCV vaccine? How does this differ between phase 1 and phase 2 areas

How much do we alter the definition of vaccinated between the VE analysis and this updated definition?

## Community Survey Results on Vaccination Status and Healthcare seeking

We went to a representative sample of the population with children under 16 living in Navi Mumbai and asked about healthcare seeking behavior and vaccination status.

The analysis is split between phase 1 areas, where people were supposed to receive vaccines

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Phase | 1 | 2 | p | test |
| n | 5378 | 4446 |  |  |
| Received Typhoid Vaccine = Yes (%) | 3606 (71.6) | 723 (17.2) | <0.001 |  |
| Typhoid Vaccine Campaign = Yes (%) | 3021 (59.4) | 106 ( 2.4) | <0.001 |  |
| Other Typhoid Vaccine = Yes (%) | 705 (13.8) | 758 (17.8) | <0.001 |  |
| Other Typhoid Vaccine Type (%) |  |  | 0.002 |  |
| Not Specified | 394 (67.7) | 504 (75.0) |  |  |
| Polysaccharide | 11 ( 1.9) | 21 ( 3.1) |  |  |
| TCV | 177 (30.4) | 147 (21.9) |  |  |

From these measures we would expect > 70% of individuals from phase 1 areas to have received some type of typhoid vaccine (The official reports of the campaign said that it was 71% of the population reached), and our data indicates nearly 60% receiving received the vaccine from the mass vaccination campaign.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Phase | 1 | 2 | p | test |
| n | 5378 | 4446 |  |  |
| Fever in last month = Yes (%) | 865 (16.1) | 762 (17.1) | 0.181 |  |
| Sought treatment for Fever (30 days) = Yes (%) | 800 (92.5) | 706 (92.7) | 0.974 |  |
| Fever Treatment Location (30 days) (%) |  |  | 0.536 |  |
| Hospital (including study sites) | 123 (15.5) | 104 (15.1) |  |  |
| Pharmacy | 65 ( 8.2) | 72 (10.4) |  |  |
| Private physician/clinic | 575 (72.7) | 491 (71.2) |  |  |
| study site | 28 ( 3.5) | 23 ( 3.3) |  |  |
| Fever where child missed school (12 months) (%) |  |  | 0.506 |  |
| Yes | 106 ( 8.1) | 80 ( 6.9) |  |  |
| Fever with hospitalization (12 months) = Yes (%) | 195 ( 3.6) | 142 ( 3.2) | 0.262 |  |

We see from the CCS data that the proportion of individuals that seek care at a study site is approcimately the same between phase 1 areas.

Within phase one areas is there a difference in hospital seeking behaviour by vaccination status?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Phase | No | Yes | p | test |
| n | 1430 | 3606 |  |  |
| Fever in last month = Yes (%) | 241 (16.9) | 568 (15.8) | 0.364 |  |
| Sought treatment for Fever (30 days) = Yes (%) | 229 (95.0) | 521 (91.7) | 0.133 |  |
| Fever Treatment Location (30 days) (%) |  |  | 0.044 |  |
| Hospital (including study sites) | 27 (12.1) | 86 (16.6) |  |  |
| Pharmacy | 26 (11.6) | 35 ( 6.8) |  |  |
| Private physician/clinic | 160 (71.4) | 381 (73.6) |  |  |
| study site | 11 ( 4.9) | 16 ( 3.1) |  |  |
| Fever where child missed school (12 months) (%) |  |  | 0.687 |  |
| Yes | 25 ( 7.8) | 76 ( 8.4) |  |  |
| Fever with hospitalization (12 months) = Yes (%) | 58 ( 4.1) | 126 ( 3.5) | 0.384 |  |

While we see a slightly higher proportion of unvaccinated phase 1 individuals reporting going to hospitals if they have a fever, a smaller proporion of those go to a study site (3.1% compared to 4.9% of unvaccinated who get fever). The sample size for those visiting a study site is small though and really does not diverge that direstically from the overall propotion of those from phase 1 areas (3.1% compared to 3.5%), indicating that from the CCS evidence we would not expect the healthcare seeking population of those in phase 1 to be highly divergent by vaccination status.

## Hospital Enrollment

Four conditions had to be met to meet the enrollment criteria

They are:

Enrollment after the vaccination campaign

Coming into a study site with at least three days fever

Older than 9 months and <= 16 years (children up to 14 were vaccinated so this might need to be coded better to track with the campaign)

Live in NMMC

|  |  |  |  |
| --- | --- | --- | --- |
| s. typhi | Phase 1 | Phase 2 | NA |
| Neg\_NA | 1498 | 1037 | 349 |
| Pos | 36 | 45 | NA |

We see that that there were a total of 81 Typhi cases meeting this case definition, 36 from phase 1 areas and 45 from phase 2 areas.

Possible limitation from data collection: As seen here, there are 349 individuals (all who test negative for S.Typhi) who have no UHP and thus no phase listed. We checked with the india team about why these individuals were missing UHP information. They responsed that the UHP/ sector variable was not required until 1/17/2019 and after that date there are no missings but from the September - December of 2018 349 hospital based who otherwise meet the enrollment definition that are missing a phase for analysis.

##### Number with VE Conducted

|  |  |
| --- | --- |
| VE Completed | Percent (%) |
| 59 | 72.8 |

Out of the 81 S.Typhi cases meeting the enrollment criteria, *59 (73%)* had a project staff member return to their house to conduct a long-form interview on the type of vaccines they had received and to check the the family’s typhoid vaccination card.

For those that were enrolled who did not test Blood culture positive, a followup house visit was not conducted and vaccination status was instead based on the materials brought with them at the time of enrollment or their recall

# TCV Vaccination Amongst Cases

|  |  |  |  |
| --- | --- | --- | --- |
| TCV\_vax | TCV\_vax\_strict | TCV\_vax\_conserved | n |
| No | No | No | 60 |
| Other type Typhoid vaccine, not Typhoid polysaccharide vaccine | No | No | 5 |
| Polysaccharide/Some Type Typhoid Vaccine written in CE/LE) | No | No | 1 |
| Some Typhoid Vaccine (Recall in CE/LE) | No | No | 2 |
| Yes (TCV/Typbar written in CE/LE) | No | Yes | 3 |
| Yes (TCV/Typbar written in CE/LE) & Other type Typhoid vaccine recalled in VE. | No | Yes | 1 |
| Yes (VE) | Yes | Yes | 9 |

Of the 81 cases, 21 had indicated receiving “Some type of typhoid vaccine” Of these we made two variables -

*TCV strict*- which counts someone only as a vaccinated individual if a TCV was found in the VE questionaire (only given to cases)

and

*TCV conserved* - which counts vaccinated as if they had received TCV through the VE questionaire or had “TCV or tybar” written on the papers they brought to the clinic on the date of enrollment. (This again overly emphesizes cases as being vaccinated)

Since we could not ensure the others (recalled getting vaccinated) were TCV positive or had received another sort of typhi vaccine they were not included in these definitions.

## Vaccinations amongst cases and controls

Using the conserved TCV vaccine definition we counted the number of vaccinated amongst phase 1 and phase 2 areas

|  |  |  |
| --- | --- | --- |
| TCV\_vax\_conserved | 1 | 2 |
| No | 1456 | 1004 |
| Yes | 78 | 78 |

Suprisingly, according to the TCV vax conserve variable there were the same number of people in phase 1 and phase 2 areas who had been vaccinated with TCV and a higher proportion of vaccinated individuals in phase 2 areas

#All Vaccination Phase 1 vs Phase 2

|  |  |  |
| --- | --- | --- |
| TCV\_vax | 1 | 2 |
| No | 1059 | 892 |
| Polysaccharide/Some Type Typhoid Vaccine written in CE/LE) | 17 | 19 |
| Some Typhoid Vaccine (Recall in CE/LE) | 380 | 88 |
| Yes (TCV/Typbar written in CE/LE) | 72 | 74 |
| Yes (VE) | 6 | 3 |
| Other type Typhoid vaccine, not Typhoid polysaccharide vaccine | NA | 5 |
| Yes (TCV/Typbar written in CE/LE) & Other type Typhoid vaccine recalled in VE. | NA | 1 |

When we look at the original TCV vax variable instead of the subsetted variable we see a higher proportion of people in phase 1 areas recall receiving “some type of Typhoid vaccination” but since there was no card or specific vaccine type recall we did not consider them “vaccinated with tcv” and because they tested negative for typhi we did not go back to those households for further confirmation.

Also even if we decide to consider the recall vaccinated as well the vaccination rate in phase 1 areas would only amount to 30.9% (475/ 1,534), much lower than the 71% expected to be vaccinated in these areas, indicating that the population seeking care is probably not a representative sample of the entire population and that we may still be missing vaccinations since we are mainly relying on recalled answers.

## Case matching

When case matching was conducted (using the matchit package), few cases or controls from phase 1 or phase two areas report being vaccinated and the proportion of vaccination is highest amongst cases (probably because of the going back to cases only for confirmation)

Vaccinated phase 1 case = 7 / 36 = 19.4%

Vaccinated phase 2 case = 6 / 45 = 13.3%

Vaccinated phase 1 control = 5 / 146 = 3.4%

Vaccinated phase 2 control = 8 / 82 = 9.8%