# Mapping zero-dose children through data triangulation

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VILLAGEREACH

**Key Insights**

- Existing methods to identify zero-dose children are technically complex, and we need more efficient methods to work towards designing policies, strategies and interventions to reach these children.
- Immunization campaigns often collect very detailed data that can be used through data triangulation to more accurately identify and estimate zero-dose children.
- In Cabo Delgado province, 10 districts out of 17 were stocked out of DTP, while in Tete two out of 15 were stocked out of DTP, indicating that even if children reached vaccine services they could not be vaccinated.

## The challenge: Identifying zero-dose kids

Over the last 20 years, routine vaccinations among children in low- and middle-income countries has increased, with 78% of children receiving routine vaccines in 2020. Despite this progress, millions of children are still left behind, and zero-dose children account for nearly half of all vaccine-preventable deaths[1].

**Defining zero-dose children**

Zero-dose children are those who do not receive any routine vaccines. For operational purposes, they are defined as not receiving a single dose of diphtheria, tetanus and pertussis-containing vaccine (DTP).

Emerging evidence suggests that zero-dose children belong to households and communities suffering from multiple sources of disadvantage and inequality, including social, political, economic and geographic[2]. Zero-dose and under-immunized children live in urban poor, rural, conflict areas and could be migrants. They may often not be counted in formal surveys or may be unable to register at a health facility due to legal status. Estimating zero-dose children is challenging for several reasons:

- Administrative or census data is often used to calculate the target population; this data may be old and, hence inaccurate which can underestimate the number of children in an area.
- Geospatial analysis is sometimes used to locate areas with reduced vaccine access. However, it is not able to provide insights for urban areas where people build vertical housing and multiple families may live in a single unit. Using spatial maps may be costly and requires specialized skills and training.
- Current methods are complex, such as using ArcGIS (a web-based mapping software) or sophisticated analytics using Bayesians statistics (data analysis approach using Bayes' theorem), which can be costly and time consuming.
- Current methods to estimate zero-dose kids do not take into account country-wide stockouts, resulting in potentially inaccurate estimations.

1 GAVI. (2022, June 17). The Zero-Dose Child: Explained. VaccinesWork. Retrieved August 15, 2022, from https://www.gavi.org/vaccineswork/zero-dose-child-explained.

2 Johri M, Rajpal S, Subramanian S V. Progress in reaching unvaccinated (zero-dose) children in India, 1992–2016: a multilevel, geospatial analysis of repeated cross-sectional surveys. The Lancet Global Health.2021, available in: https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(21)00349-1/fulltext, accessed on: March 17, 2022.

## THE GLOBAL DRIVE TO VACCINATIONS

Gavi's 5.0 Strategy aims to "leave no-one behind with immunization" by reaching zero-dose and missed communities. To achieve this, the strategy seeks to seeks to reduce the number of zero-dose children by 25% in 2025 and 50% in 2030[3]. Identifying children by mapping them is the first step in VillageReach's framework to promote immunization equity aligning with Gavi's Identify-Reach-Monitor-Measure-Advocate (IRMMA) framework, as shown in Figure 1. To meet this ambitious goal, identifying the specific regions where there are zero-dose children is a critical tool, allowing governments and organizations to target specific areas to increase vaccine availability and access.

*Figure 1: VillageReach's equity framework*


To support the global effort to reach zero-dose children, VillageReach recommends using data triangulation of existing data to identify zero-dose children. This can also help improve the supply chain design and forecasting and address barriers. We piloted the approach in Tete and Cabo Delgado provinces of Mozambique and have included the results of this case study below. This accessible method can be used in other countries to identify zero-dose children using existing data.

# Using data triangulation to identify zero-dose kids

Immunization campaigns often collect very rich data about the immunization status of children. They frequently go to the last mile to vaccinate children, which sometimes requires them to go door-to-door to gather information. While this data is intended to be used to inform routine immunization, it very often does not. VillageReach used data triangulation to leverage current data from immunization campaigns for measles in 2018 and from routine immunization to estimate zero-dose children in each district.

As we illustrated in our Mozambique case study, campaign data is obtained through an independent and in-depth process and offered a more accurate landscape of who is not vaccinated and where they live. Hence, the number of children vaccinated during campaigns was considered the real target population.

*Figure 2: Cabo Delgado and Tete provinces, Mozambique*


[3] Gavi, Reaching Zero Dose Children. 2021, available in: https://www.gavi.org/our-alliance/strategy/phase-5-2021-2025/equity-goal/zero-dose-children-missed-communities, accessed on March 16, 2022.

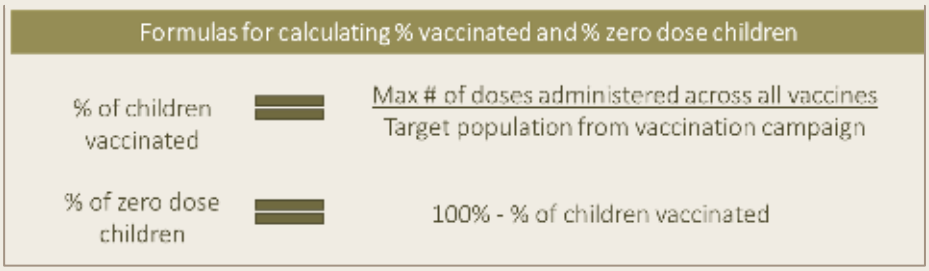
## A CASE STUDY: MOZAMBIQUE

The Cabo Delgado, and Tete provinces in Mozambique have 68% and 70% coverage of the third dose of DTP-3 containing vaccine, respectively. Due to this relatively low coverage, VillageReach selected these provinces to triangulate and compare data from the 2018 Measles and Rubella vaccination campaign and 2018 routine immunization services.

### The zero-dose formula

Immunization campaigns often collect more accurate data and vaccinate more children. Therefore, we considered campaign data to be a better estimation of the true target population. Coverage rates are often estimated using DTP-3; however, with supply shortages or stockouts, children may reach a health facility but not get vaccinated for DTP. Because of this, we compared the number of children vaccinated across multiple vaccines (DTP, pneumococcal, polio and rotavirus) – all administered at the same time – to assess which antigen had the highest number of children vaccinated. We then compared that data with the measles campaign data to estimate the proportion of children vaccinated as shown in Figure 3. From this result, we can estimate the proportion of zero-dose children by subtracting from the goal of 100% coverage.

*Figure 3: Formula for calculating zero-dose kids*




### Our findings

Our analysis revealed that 10 districts out of 17 were stocked out of DTP in Cabo Delgado, and 2 out of 15 in Tete, indicating that even if children reached vaccine services, they could not be vaccinated. There is a need to improve supply chain and reduce stockouts to reach zero-dose kids. Using the formula above, we estimated there are three districts in Cabo Delgado with over 45% zero-dose children, and five districts in Tete with about 30% zero-dose children.

# Expanding analysis to countries

Data triangulation uses already-available data, and provides an easy-to-use method for assessing zero-dose children. It considers the specific context of the country, and can be used by immunization program managers to estimate zero-dose children.

Countries looking to apply this method, should consider using data from multiple sources and identifying the location of data, as outlined below.

## LEARNINGS AND CONSIDERATIONS

- Using data from multiple sources, including vaccination rate and number of preventable disease cases, transportation accessibility and maternal birth numbers, allows us to better estimate and understand the reasons for zero-dose children. Additionally, we can also assess if there is a correlation between zero-dose children and vaccine-preventable diseases for specific locations.
- This analysis can be expanded to specific subnational areas to quantify and reach more zero-dose children. For example, in Mozambique, using a district-level analysis allowed us to capture the zero-dose vaccine landscape by district, and this could also be done at the health facility level.

*For more information about using data triangulation to map zero-dose children, please contact Timoteo Chaluco, Program Manager, timoteo.chaluco@villagereach.org.*

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