What is this? A document explaining how we arrive at our state-specific baseline coverage and treatment effect (i.e., improvement in vaccination coverage) estimates for our New Incentives cost-effectiveness analysis (CEA).

Links

- Baseline vaccination coverage and treatment effect model

What's the problem?

The New Incentives program—one of GiveWell's Top Charities—provides conditional cash transfers to caregivers in Nigeria to incentivise routine child vaccination. In our previous CEA of the program, we had assumed a constant baseline vaccination coverage of 39% and a program treatment effect (i.e., the improvement in vaccination coverage) of 22% across all modeled Nigerian states. However, we recognized that these assumptions were increasingly inaccurate as New Incentives expanded further from the three states originally included in the randomized controlled trial (RCT) of its program. We know that baseline coverage differs between states and hypothesize that treatment effect is likely to differ by baseline coverage.[1] As a result, we noted in our November 2022 grant page that one of our next priorities would be to update our cost-effectiveness analysis accordingly.[2]

Our approach

Estimating baseline vaccination coverage

In order to arrive at a single estimate of baseline coverage for each state we needed to decide:

1. What data (or combination of data) on state-level vaccination coverage rates to use
2. What adjustments, if any, to make to this data based on our understanding of any potential biases in how it was collected
3. How to aggregate data on coverage across multiple vaccines to a single estimate

[1] Higher baseline coverage means that there is a smaller pool of caregivers that could conceivably be influenced by incentives.
[2] See here.

What coverage data to use?

At a high-level, our approach was to: i) use data collected by New Incentives where available, and ii) use data collected by the 2021 Multiple Indicator Cluster Survey (MICS)[3] where not.

In more detail:

1. The primary data we use for vaccination coverage rates comes from household surveys ("rapid assessments") conducted by New Incentives in each area that it considers for program expansion.[4] During these surveys, enumerators visit households from randomly sampled enumeration areas[5] to ask caregivers about which vaccines their children have received.[6] These surveys typically cover only a subset of local government areas (LGAs) in a state.[7] As a result, multiple rapid assessments are conducted in each state and thus they provide a more granular picture of vaccination coverage relative to state-level estimates (such as from the MICS).
    a. We use the qualified (rather than planned) estimates from New Incentives' rapid assessments, except in two cases of limited qualified data.[8] Qualified estimates are derived from surveys that

[3] "The Multiple Indicator Cluster Survey (MICS) was carried out in 2021 by the National Bureau of Statistics (NBS) as part of the Global MICS Programme. . . . The Global MICS Programme was developed by UNICEF in the 1990s as an international multi-purpose household survey programme to support countries in collecting internationally comparable data on a wide range of indicators on the situation of children and women." National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF), MICS 2021, Survey Findings Report, Nigeria

See the MICS data we use here.

[4] "New Incentives will group local government areas (LGAs) it expands to within a given state at a given point in time into 'expansion groups'. New Incentives will then collect coverage data in these expansion groups once before the start of operations to establish baseline coverage rates." IDinsight, Coverage Monitoring Analysis Plan, 2021, p. 1.

These expansion groups are called 'cohorts.'

[5] "NI-ABAE [New Incentives] will draw a stratified random sample of enumeration areas (EAs) from the geographic area of the expansion group proportionate to population size. . . . The resulting sample of EAs will be spread across all LGAs in the expansion group and all wards within these LGAs. By definition, NI-ABAE will not sample EAs that are indicated to contain no population." IDinsight, New Incentives Coverage Monitoring Protocol, 2021, pp. 5-6.

[6] "Through its field staff, New Incentives now routinely collects information from households to monitor vaccination coverage in cohorts of local government areas (LGAs) in which it is operating." IDinsight, Insights from New Incentives' Coverage Monitoring Data, December 2022, p. 3.

[7] See the number of LGAs included in each cohort for which we have received rapid assessments results here.

[8] Approximately 50% of initial surveys in cohorts 3 and 4 failed quality checks and were replaced. See IDinsight, Insights from New Incentives' Coverage Monitoring Data, December 2022, p. 8, Table 3.

For those two cohorts, we use an average of qualified and planned estimates. For more information on our plans for analyzing the data from cohorts 3 and 4, see the addendum on this page.

have passed basic quality checks (e.g. whether the listed response matches the recorded audio),[9] so we think these are less likely to be biased.

2. The secondary data we use for vaccination coverage rates is data collected by the 2021 MICS survey, a nationally representative survey of Nigeria run by UNICEF that has a module on childhood vaccinations.[10] This data provides baseline coverage estimates for each state and for each vaccine type.[11] We consider this survey to be a fairly reliable source given it has a large sample size relative to other datasets we considered[12] and our qualitative impression is that other researchers consider it a reliable source. We also found that it had the most agreement with the rapid assessment data relative to other sources we looked at.
3. We then determined the following rules for which data source to use for each state:
    a. For states where New Incentives has sampled <60% of the local government areas (LGAs), we take the midpoint between the rapid assessment estimates and the MICS estimates. While we prefer using the rapid assessment estimates where available,[13] we opt to take an average in this case to hedge against possible sampling bias.
    b. The one exception to the above is that for the measles vaccine, we use the MICS estimates for all states, since we think it is possible that the rapid assessments may systematically underestimate coverage of the measles vaccine.[14]

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- "New Incentives follows a strict data quality protocol that includes randomly backchecking 50% of surveys and audio checking 95% of surveys. The data quality checks are run on a batch of surveys. If the entire batch fails the data quality assessment ('discarded'), it is replaced with another batch ('replacement')." IDinsight, Insights from New Incentives' Coverage Monitoring Data, December 2022, p. 4.
- "Surveys are counted as 'Planned' when a Batch is created as part of the initial Enumeration area derivation. 'Qualified' surveys are surveys from the batches that qualified to be part of the survey result." New Incentives, Replacement Analysis: Coverage changes due to enumeration area replacements, 2023 (unpublished).

[10] "The Multiple Indicator Cluster Survey (MICS) was carried out in 2021 by the National Bureau of Statistics (NBS) as part of the Global MICS Programme. . . . The Global MICS Programme was developed by UNICEF in the 1990s as an international multi-purpose household survey programme to support countries in collecting internationally comparable data on a wide range of indicators on the situation of children and women." National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF), MICS 2021, Survey Findings Report, Nigeria

[11] See the MICS data we use here.

[12] The survey sample consisted of 31,103 eligible children under the age of five. 30,804 caretakers of those children were interviewed, resulting in a response rate of 99%. National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF), MICS 2021, Survey Findings Report, Nigeria, p. iii.

[13] We prefer using the rapid assessment estimates because we feel we have a better understanding of the data collection process, and are satisfied with the quality checks being administered by New Incentives.

[14] The rapid assessments target 6-12 month old infants but measles eligibility only starts at 9 months old. Since measles vaccines can be delayed until 12+ months, we think it's possible that the rapid assessments are systematically underestimating coverage for this vaccine. The MICS survey, by contrast, collects data on infants aged 12-23 months.

- "The unit of analysis is the individual 6-12-month-old infant." IDInsight, Coverage Monitoring Analysis Plan, 2021, p. 4.
- "For Measles 1 coverage and full vaccination outcomes (loose and strict), the analysis sample also consists of the expansion group but is restricted to infants aged 9 to 12 months." IDInsight, Coverage Monitoring Analysis Plan, 2021, p. 4.

c. To estimate PCV coverage (which is not included in New Incentives' rapid assessments)[15] in the specific area covered by the rapid assessment, we estimate coverage based on coverage of the Penta vaccine[16] found in the rapid assessment, adjusted using the ratio of PCV coverage to Penta coverage observed in the MICS data.
d. Rotavirus vaccine coverage is not included in either New Incentives' rapid assessments or the MICS as the rotavirus vaccine was not introduced into the Nigerian vaccination schedule until August 2022.[17] In both cases, we estimate future, steady-state rotavirus vaccine coverage based on the PCV coverage estimate since these vaccines are administered at the same time.[18]

What adjustments need to be made to the data?

As with the data collected during the New Incentives RCT[19], we were concerned that self-reported vaccination coverage may overestimate vaccination coverage as a result of social desirability bias. Because BCG vaccination typically leaves a scar[20], we can compare the rate of BCG scars detected to the expected scar rate to estimate what we believe true BCG vaccine coverage to be. We then compare that value to the reported value to understand the extent of possible overreporting.

In more detail:

- "Percentage of children age 12-23 months currently vaccinated against vaccine preventable childhood diseases (Crude coverage)" National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF), MICS 2021, Survey Findings Report, Nigeria, p. 175

[15] "The Routine Immunization survey administered during coverage monitoring does not collect information on PCV status." IDInsight, Coverage Monitoring Analysis Plan, 2021, p. 2 footnote 6.

[16] The Penta and PCV vaccines are administered on the same schedule. See the routine vaccination schedule on New Incentives' website.

[17] Rotavirus vaccine rollout was officially launched in August 2022. Gavi, "Dealing with diarrhoea: Nigeria introduces rotavirus vaccine into its immunisation plan," August 30, 2022.

[18]

- "The Executive Director of the National Primary Health Care Development Agency, Dr Faisal Shuaib, says that the vaccine, which takes the form of oral drops, will be administered to infants at 6, 10 and 14 weeks, alongside other routine vaccines." Gavi, "Dealing with diarrhoea: Nigeria introduces rotavirus vaccine into its immunisation plan," August 30, 2022
- The PCV vaccine is also administered at 6 weeks, 10 weeks, and 14 weeks. See the routine vaccination schedule on New Incentives' website.

[19] See our discussion about self-report bias in regards to the RCT here.

[20] "BCG vaccination usually causes a scar at the site of injection due to local inflammatory processes. However scar formation is not a marker for protection and approximately 10% of vaccine recipients do not develop a scar." WHO, BCG vaccines position paper, 2018, p. 84.

4. To adjust the qualified estimates from New Incentives' rapid assessments to account for possible reporting bias, we use data provided by New Incentives on BCG scarring rates.[21] These represent the % of children surveyed for which BCG scars were detected by the surveyor.
5. To calculate an average reporting bias adjustment that we could use across states, we first calculated the average BCG coverage and BCG scarring rates reported in the rapid assessment results we have received to date (as of May 2023). We weighted these averages by the population sizes of the surveyed cohorts.[22]
6. Based on a quick literature review of studies reporting BCG scarring rates in Nigeria, we would expect approximately 90% of infants who received the BCG vaccine to have a scar.[23] We then backed out what we would expect true BCG coverage to be, given the average reported scarring rate and assuming that rate reflects 90% of vaccinated infants. Comparing our estimate of true BCG coverage to the average reported BCG coverage yields a downwards adjustment that can be applied to raw coverage estimates to account for self-reporting bias.
7. We apply the same adjustment for self-reporting bias to coverage estimates of each vaccine,[24] which results in adjusted by-vaccine coverage estimates for all of the states for which New Incentives has rapid assessment data. At the time of this writing (July 2023), this was 9 states,[25] but we expect to keep updating our spreadsheet as new rapid assessment data comes in.
8. We apply the same adjustment for reporting bias to the proportion of MICS' estimates that are based on self-reports, since we do not believe the MICS survey adjusts for reporting bias.[26]

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[21] This data is collected during the rapid assessment surveys. See the data here.

[22] See our calculations here.

[23] We found three studies reporting scarring rates of 82-96%. These average to 87% (unweighted) which is roughly in line with the 90% cited by WHO as the BCG scar rate in its 2018 position paper.

- "BCG vaccination usually causes a scar at the site of injection due to local inflammatory processes. However scar formation is not a marker for protection and approximately 10% of vaccine recipients do not develop a scar." WHO, BCG vaccines position paper, 2018, p. 84.
- "Two hundred and six subjects (96.3%) had a postvaccination BCG scar." Atimati and Osarogiagbon 2014
- "The prevalence of BCG scar was 79.5% among the male infants and 84.7% among the female infants, while the overall prevalence of BCG scar was 81.5%." Gambo et al. 2014
- "Although 84.2% had physical evidence of BCG inoculation only 69.8% had developed detectable sensitization to the tubercle bacilli as shown by the Mantoux test." Odujinrin and Ogunmekan 1992

[24] This assumes reporting bias is consistent across vaccine types, which we think is a reasonable assumption. We would find it generally surprising if people were more likely to misreport one vaccine over others, though it is possible the timing of the vaccine visit and the number of vaccines given at the same visit could affect caregiver recall.

[25] These 9 states are Adamawa, Bauchi, Gombe, Jigawa, Kaduna, Kano, Katsina, Kebbi, and Sokoto. See here.

[26]MICS estimates of vaccine coverage are based on data from childrens' vaccination cards, but in cases where these cards are unavailable, caregivers are asked to report their child's vaccination status. We apply a reporting bias adjustment to the proportion of data coming from these self-reports; see our calculation here.

"Information on vaccination coverage was collected for all children under three years of age. All mothers or caretakers were asked to provide vaccination cards received at health facilities. If the vaccination card for a child was available, interviewers copied vaccination information from the cards into the MICS questionnaire. If no vaccination card was available for the child, the interviewer proceeded to ask the mother to recall whether the child had received each of the vaccinations, and, for applicable antigens, how many doses were received. The final vaccination coverage estimates are based on information

How to aggregate across vaccines?

Our previous baseline vaccination coverage estimate was based only on coverage of the BCG vaccine (the first vaccine given).[27] However, given New Incentives' program provides incentives for a range of routine childhood vaccinations, we decided to create a weighted average estimate of baseline vaccination coverage, accounting for baseline coverage of all the vaccine doses directly incentivized by New Incentives, plus the rotavirus vaccine.[28] We weighted coverage for each vaccine dose based on our estimate of how much each vaccine dose contributes to the program's primary benefit.

In more detail:

9. To convert by-vaccine coverage estimates to an aggregate estimate, we weight each vaccine by its contribution to the primary benefit of New Incentives' program (averting under 5 deaths from vaccine-preventable diseases). For example, the second dose of PCV (pneumococcal conjugate vaccine) on average contributes 22% to the primary program benefit, whereas the first dose of the measles vaccine contributes approximately 6% on average (meaning we expect PCV 2 on average to avert a greater share of under 5 deaths from vaccine-preventable diseases than Measles 1).[29]
10. To calculate each vaccine's contribution to under 5 mortality reduction, we take into account mortality associated with the diseases targeted by each vaccine, estimates of each vaccine's efficacy in protecting against those diseases, and assumptions regarding how vaccine efficacy breaks down by dose for multi-dose vaccines.
    a. We use state-level estimates of mortality from vaccine-preventable diseases from the Institute for Health Metrics and Evaluation's 2021 Global Burden of Disease model to calculate the proportion of vaccine-preventable deaths attributed to the diseases targeted by each vaccine.[30]
    b. We then adjust those proportions to account for the estimated efficacy of each vaccine in preventing disease.[31] Adjusting for vaccine efficacy increases the overall contribution of

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obtained from the vaccination card and the mother's report of vaccinations received by the child." National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF), MICS 2021, Survey Findings Report, Nigeria, p. 170.

The lack of adjustment for reporting bias can also be seen in the 99% coverage that is reported for some states (see Table TC 1.2 on page 174).

[27] See our previous calculations here. See the recommended timing of BCG vaccination on the routine vaccination schedule on New Incentives' website.

[28] The rotavirus vaccine is currently indirectly incentivized as it is given at the same time points as the PCV and pentavalent vaccines, which are directly incentivized. However, we directly model its effect given the meaningful contribution of the rotavirus vaccine to the primary benefit of New Incentives' program (i.e., averting under 5 deaths from vaccine-preventable diseases). See here.

[29] See the breakdown of each dose's average contribution to under 5 deaths averted here.

[30] See our calculations here.

[31] We base our estimates of vaccine efficacy on the results of meta-analyses from the Lives Saved Tool, Mangtani et al. 2014, and Thumburu et al. 2015. See the efficacy estimates we use here.

vaccines with high estimated efficacy (such as BCG) and decreases the contribution of vaccines with lower estimates of efficacy (such as the rotavirus vaccine).

c. The vaccine efficacy estimates we use estimate the protection provided by a full course of each vaccine (e.g., in the case of PCV, receiving all three doses). In order to estimate the contribution of each individual dose incentivized by New Incentives, we came up with rough estimates of the marginal efficacy of each dose (i.e. how much protection is provided by a first dose compared to a second dose, etc.), based on a quick literature review. Applying these marginal efficacy assumptions results in by-dose estimates of the contribution of each vaccine to averting under 5 deaths. [32]

Results

This method yields the following aggregate coverage estimates for each state. These estimates pass a few rough sense-checks, which increase our confidence in them:

- States in northern Nigeria (especially northwestern Nigeria) appear to have the lowest rates of coverage, consistent with the MICS data[33]
- The variance of our coverage estimates between states seems consistent with the variance reported in the raw MICS data (i.e. our various transformations/aggregations don't lead to major changes in the overall pattern)[34]

Estimating program treatment effects based on baseline vaccination coverage

In order to arrive at a state-specific treatment effect (i.e., the impact on vaccination rates) of the New Incentives program, we:

1. Calculated state-specific baseline coverage and treatment effect for each state in the randomized controlled trial (RCT) of the New Incentives program.

[32] See the resulting estimates here. Those estimates, and our marginal efficacy assumptions, were calculated on a supplemental spreadsheet that we do not yet have permission to publish. We are relatively uncertain about our marginal efficacy assumptions as they were informed by limited available data.

[33] For example, the 2021 MICS survey shows a similar regional pattern in terms of % of children that have received the full immunization schedule. See 2021 MICS Statistical Snapshots, "Completeness of Routine Immunisation," p. 31.

[34] See the unadjusted MICS data in the MICS tab here.

2. Calculated the average treatment effect in the RCT as a reduction in the share of unvaccinated infants. We assume that there's a negative relationship between the treatment effect and baseline coverage, and that the treatment effect diminishes at a constant rate.[35]

3. Applied this same proportional reduction in the share of unvaccinated infants to all states.

4. Sense-checked the resulting estimates against comparable treatment effects reported in the conditional cash transfers (CCT)-for-vaccines literature.

In more detail, we:

- Estimated baseline coverage at the time of the RCT of New Incentives' program, which took place in Jigawa, Katsina, and Zamfara states from 2018-19.[36] Overall, we estimate a 36% coverage rate in these states.[37]
- Estimated the percentage point increase in vaccination rates from the RCT. Across the three RCT states, we estimate that the New Incentives program increased vaccination takeup by 21 percentage points.[38]

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[35] We express the treatment effect in the RCT as a reduction in the share of unvaccinated infants as a way to scale the magnitude of the treatment effect in a given area based on baseline vaccine coverage in that area. In doing so, we are assuming a linear, downward sloping relationship between treatment effect and baseline coverage (i.e. the treatment effect decreases at higher rates of baseline coverage). We made this assumption since it is relatively simple to model and fits with our intuitive impression that the treatment effect would decrease as vaccine coverage increases. However, we are uncertain about this assumption and are continuing to research the relationship between treatment effect and baseline coverage.

[36] "This study is an impact evaluation of the NI-ABAE CCTs for RI Program in Katsina, Zamfara, and Jigawa States in North West Nigeria . . . . The RCT window ran from July 2018 to October 2019." IDinsight, Impact Evaluation of New Incentives, Final Report, 2020, p. 7.

[37] As discussed above, we weight coverage of each vaccine by that vaccine's contribution to the primary benefit of New Incentives' program.

We estimate lower rates of coverage than those implied by New Incentives' rapid assessments and the MICS (see comparison here). This may represent an improvement in coverage between when the RCT was completed in late 2019/early 2020 and when the MICS coverage estimates and coverage estimates from New Incentives' rapid assessments were collected (late 2021-early 2023).

- "The endline survey took place from November 2019 to February 2020." IDinsight, Impact Evaluation of New Incentives, Final Report, 2020, p. 8.
- "Fieldwork began in September 2021 and concluded in December 2021." National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF), MICS 2021, Survey Findings Report, Nigeria, p. 6
- New Incentives' rapid assessments were conducted over a period spanning from September 2021 (for cohort 1) to March 2023 (for cohort 19). See the "survey period" dates listed here.

[38] Consistent with our baseline coverage estimates, we weight the aggregate treatment effect by each vaccine's contribution to the program's primary benefit. The 21% figure we get broadly triangulates with the 22% figure in our previous CEA.

See our calculations here.

- Converted these estimates to an estimate of the % reduction in the share of unvaccinated children, assuming a downward sloping, linear relationship between the treatment effect and baseline vaccine coverage. Across RCT states, (1 - 0.36) = 64% of infants were unvaccinated, and the program led to a 21 percentage point increase in vaccine takeup. This implies that 0.21/0.64 = 33% of vaccinated infants would have been unvaccinated in the absence of New Incentives' program. In other words, the program resulted in a 33% reduction in the share of children that were unvaccinated.
- Assumed this 33% reduction in the share of unvaccinated children remains constant across states.

This method yields the following treatment effect estimates for each state. These estimates pass a few rough sense-checks, which increase our confidence in the approach:

- The relationship between coverage and treatment effects is downward sloping. This captures the intuitive idea that treatment effects should fade-out as coverage expands, as the share of caregivers amenable to incentives diminishes.
- The maximum treatment effect we estimate from this method (26% in Sokoto, where we estimate a baseline vaccine coverage rate of 23%) seems in the same ballpark as the maximum effect size we identified in the cash-for-vaccines literature: 33% in Banerjee et al. 2010 (with a full vaccination coverage rate of 6% in the control group).[39] As described above, our baseline coverage estimates are aggregate estimates weighted by each vaccine's contribution to under 5 mortality reduction. We would generally expect rates of full vaccination coverage to be lower than our aggregate estimates, so we believe these treatment effects are in the same ballpark.
- The existence of positive treatment effects even at moderately high rates of baseline coverage (e.g. in Adamawa and Kogi states) is supported by two additional cash-for-vaccine papers, which found small positive effects even at high rates of baseline coverage. Gibson et al. 2017 finds a 4-8 percentage point increase in vaccine takeup in Kenya at 82% rates of full immunization in the control group,[40] and

[39] "134 villages were randomised to one of three groups: a once monthly reliable immunisation camp (intervention A; 379 children from 30 villages); a once monthly reliable immunisation camp with small incentives (raw lentils and metal plates for completed immunisation; intervention B; 382 children from 30 villages), or control (no intervention, 860 children in 74 villages). . . . Among children aged 1-3 in the end point survey, rates of full immunisation were 39% (148/382, 95% confidence interval 30% to 47%) for intervention B villages (reliable immunisation with incentives), 18% (68/379, 11% to 23%) for intervention A villages (reliable immunisation without incentives), and 6% (50/860, 3% to 9%) for control villages." Banerjee et al. 2010, p. 1.

39 - 6 = 33 percentage point treatment effect.

[40]"Overall, 1375 (86%) of 1600 children who were successfully followed up achieved the primary outcome, full immunisation by 12 months of age (296 [82%] of 360 control participants, 332 [86%] of 388 SMS only participants, 383 [86%] of 446 SMS plus 75 KES participants, and 364 [90%] of 406 SMS plus 200 KES participants)." Gibson et al. 2017, p. 1.

86 - 82 = 4 percentage point treatment effect for the group receiving SMS reminders and a small cash incentive (75 KES).
90 - 82 = 8 percentage point treatment effect for the group receiving SMS reminders and a larger cash incentive (200 KES).

Robertson et al. 2013 finds a 6 percentage point increase in Zimbabwe at 70% rates of full immunization.[41]

Ways our estimates could be wrong and possible next steps

- **If the relationship between vaccine coverage and takeup is nonlinear:** our linearity assumption is probably an oversimplification, but we believe it fits the data points we have reasonably well and is an intuitive approach. If we spend more time on this, we might explore the possibility of a non-linear model, although our current sense is that any increased accuracy wouldn't be worth the added complexity.
- **If treatment effects fade out faster than our current model implies:** our initial approach assumed a steeper relationship between coverage and treatment effects, but we updated this after finding papers that reported positive treatment effects even at high rates of baseline coverage. If there are reasons that these effects wouldn't translate to the Nigerian context,[42] it's possible that we're overstating the treatment effects at higher rates of coverage. With this being said, we're generally less concerned about what the function 'looks' like at >80% rates of coverage, since states at >80% coverage would be unlikely to meet our cost-effectiveness bar anyway.[43]
- **If our aggregation procedure obscures differences between vaccines:** we aggregate both coverage and treatment effects across vaccine types, and it's possible that we lose information in this procedure. While this aggregation procedure keeps the model simple, we may consider separately modeling the coverage/treatment effects of different vaccines in the future.
- **Re-estimating program treatment effects using future New Incentives data:** In the future, it may be possible to use data from New Incentives' follow up surveys to estimate the effects of the New Incentives program in each state. This data would be non-experimental, but might provide a helpful sense-check to our current method, which relies on data from the New Incentives RCT.

[41] See "Overall" row (row 11), of Table 2 of Robertson et al. 2013. Full vaccination rate was 70% in the control group, 76% in the unconditional cash transfers (UCT) branch, and 76% in the conditional cash transfers (CCT) branch.

76 - 70 = 6 percentage point treatment effect.

[42] Robertson et al. 2013 was conducted in Zimbabwe and Gibson et al. 2017 was conducted in Kenya. These contexts might differ from Nigeria in meaningful ways (e.g. if vaccine supply constraints differ in those countries, this might affect the share of caregivers that could conceivably be influenced by incentives).

[43] The intuition here being that if New Incentives only led to e.g. a 5 percentage point uptick in vaccinations in a certain state, this would be unlikely to meet our cost-effectiveness bar. You can experiment with this in our New Incentives CEA: changing the treatment effect in row 36 to 5% causes the program to fall below our 10x cash bar.