RESULTS FOR DEVELOPMENT

POLICY BRIEF

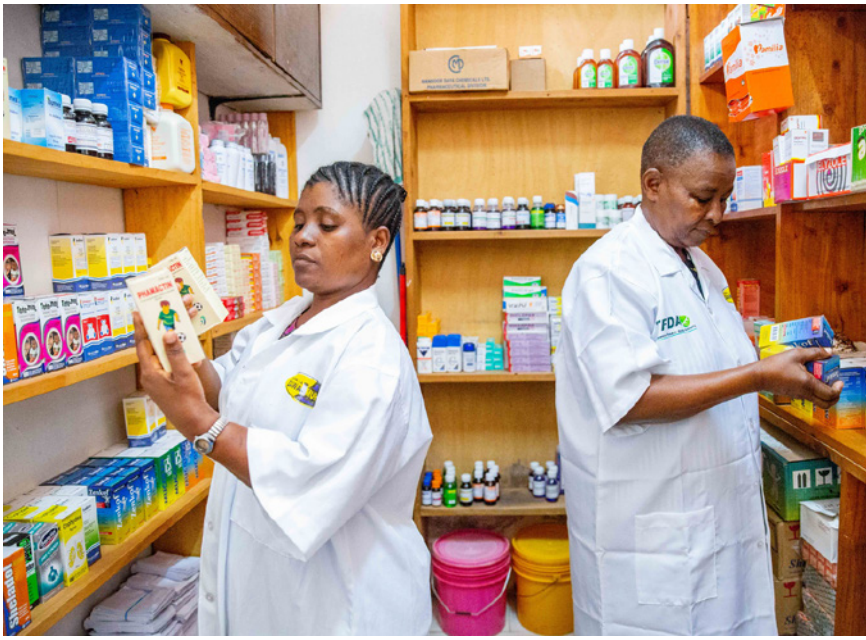
Reducing Child Mortality in Tanzania by Increasing Access to Pediatric Pneumonia Treatment

January 2019

OVERVIEW

Pneumonia is the leading cause of death in children under five (CU5) in Tanzania, contributing to more deaths than malaria, diarrhea or sepsis

Lowering pneumonia-related mortality is key to achieving the Government of Tanzania's (GoT) goal of reducing overall child mortality by 80% by 2030.[1] Over the past couple of years, access to the first-line treatment for childhood pneumonia, amoxicillin dispersible tablets (amox DT)[2], has increased, with pneumonia treatment becoming available to more children at public health facilities. However, increasing the rational use of amox DT – i.e., ensuring it is being prescribed to children who need it, and not to patients with illnesses requiring other medicines – will be of critical importance to ensure that increased treatment availability leads to reductions in child mortality.



Drug dispensers managing inventory at an Accredited Drug Dispensing Outlet (ADDO) in Dar es Salaam. © Results for Development

A market landscape analysis and available evidence informed the development of interventions to increase access to childhood pneumonia treatment and to improve rational use

In 2014, the GoT updated Tanzania's clinical guidelines to make amox DT the first-line treatment for childhood pneumonia, in line with the World Health Organization's (WHO) guidelines, and added the product to the Essential Medicines List. However, according to available data sources in 2015, pediatric amoxicillin[3] was among the most commonly stocked out child health medicines in public health facilities, leading to inconsistent availability and low levels of access to pneumonia treatment.[4] Multiple constraints on the GoT's health budget at the time meant there were limited resources available to procure the necessary quantities of amox DT to meet demand across all tiers of the public health system. While UNICEF provided initial support to meet demand by procuring the first batches of amox DT starting in 2015 (totaling 16 million tablets), after project funding ended in 2016, the GoT was again faced with imminent stockouts.[5]

While ensuring that amox DT is consistently available in health facilities is necessary to lower child deaths from pneumonia, it is not sufficient. Mortality reduction requires the rational use of amox DT for pneumonia, as well. This largely depends on providers comprehensively following the Integrated Management of Childhood Illness (IMCI) steps to diagnose pneumonia in children and then appropriately prescribing amox DT for treatment. In 2016, there was no robust data measuring how accurately providers were diagnosing pneumonia patients and prescribing treatment, creating a large evidence gap for policy-makers.

INTERVENTION SUMMARY

Programmatic activities

To address the inconsistent availability of amox DT, Results for Development (R4D) and the GoT, along with support from key partners,[6] developed a holistic market shaping strategy[7] in 2015 that included several programmatic activities. This strategy sought to increase the accessibility and rational use of amox DT by tackling barriers to the financing, supply, demand and regulatory aspects of the amox DT market. The activities R4D has been implementing as part of this strategy include:

1. **Supporting the GoT to mobilize resources** for programming to increase access to and appropriate use of amox DT, including establishing a co-financing agreement between MoHCDGEC[8] and R4D to formalize the plan for the sustainable financing of amox DT procurement through 2021.

2. **Administering catalytic financing to procure approximately 5.5 million full courses of treatment of amox DT,** which, alongside the GoT's complementary financing, covers projected need through 2021.

3. **Promoting increased market transparency** to facilitate the registration of high-quality amox DT suppliers.

4. **Improving the robustness of the amox DT quantification methodology** by analyzing both consumption and morbidity data to ensure efficient resourcing of medicines.

5. **Developing a sustainable procurement strategy by transitioning the role of procurement agent for amox DT** from UNICEF Supply Division to Tanzania's national procurement agency, the Medical Stores Department (MSD).

6. **Regular refinement of policies related to amox DT,** including the Standard Treatment Guidelines (STGs), Pediatric STGs (P.STGs) and Accredited Drug Dispensing Outlet (ADDO) drug list.

7. **Collaborating with stakeholders in the private sector** to measure the size of the pediatric amoxicillin market and to catalyze availability of amox DT in private drug shops, such as ADDOs.

8. **Scoping the landscape for access to oxygen therapy services** for treatment of severe pneumonia, as well as for severe maternal, newborn and child illnesses and complications.

Evidence generation activities

As part of the childhood pneumonia market shaping strategy, a few areas for measurement and piloting were also identified. Alongside the ongoing programmatic activities previously outlined, the GoT, R4D and IDinsight* partnered[9] to design data collection activities to monitor progress in availability of amox DT at frontline points of care and to better understand the current status around the rational use of amox DT for pneumonia. These activities included:

- **Health facility and private drug shop surveys:** A nationally representative survey of 624 public health facilities was conducted in all mainland regions of Tanzania, across public dispensaries, health centers and district hospitals. Additionally, a survey was conducted in a representative sample of Accredited Drug Dispensing Outlets (ADDOs) in the three regions of Kagera, Mtwara and Pwani. Availability and stocking levels of amox DT and comparator medicines were measured across all surveyed facilities and outlets. These surveys were conducted in March, July and November 2017.

- **Pneumonia diagnosis and prescription study:** A clinical study was conducted, examining a sample of 850 CU5 seeking care in 83 public health facilities in Dodoma, Pwani and Tabora regions. The study used lung ultrasound examinations[10] to measure the rate of over- and under-diagnosis of pneumonia as compared with routine diagnosis according to IMCI guidelines. The study also measured over- and under-prescription of pediatric amoxicillin for pneumonia.

- **Piloting quality of care (QoC) interventions:** Following focus group discussions, a small-scale pilot of cost-effective, scale-able interventions aimed at improving provider diagnosis and treatment behavior was conducted in 39 public health facilities in Dar es Salaam and Morogoro. The interventions piloted included remote clinical mentoring, clinical mentoring using case studies, mobile messaging and visual aids (in the form of job aids and posters). Interventions to improve ADDO dispenser behavior were also piloted in 15 ADDOs in Dar es Salaam.

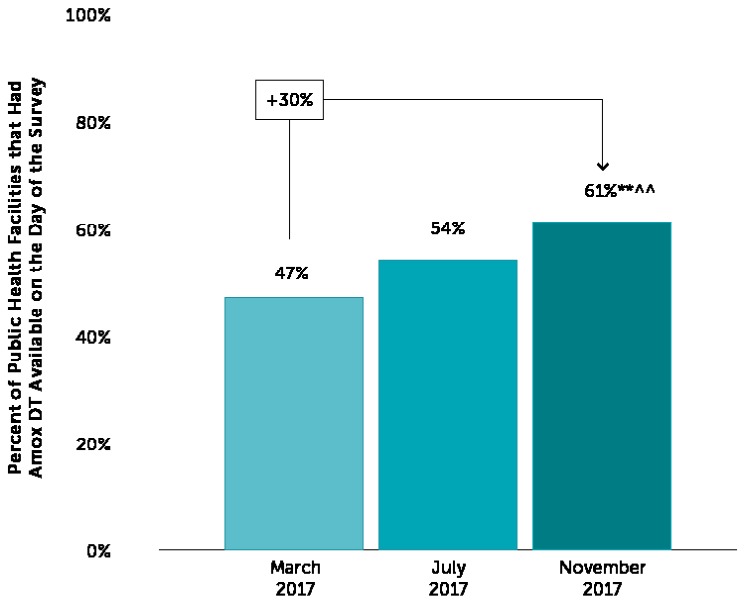
* R4D would like to recognize the contributions of IDinsight to the design of the evidence-generation activities.

KEY FINDINGS

1. Amox DT is now more widely available for children with pneumonia at public health facilities

Throughout the course of 2017, the proportion of facilities that had amox DT available increased 30% (or 14 percentage points), from 47% of facilities in March to 61% of facilities in November (see Figure 1).[11] These important gains in availability mean that more children now have access to this lifesaving treatment. However, continued efforts are needed to ensure availability for the approximately 40% of all public facilities that did not have amox DT in stock on the day of the survey.

FIGURE 1: 30% MORE FACILITIES HAD AMOX DT AVAILABLE IN NOVEMBER 2017 THAN IN MARCH 2017[12]



2. Amox DT is more consistently available in public health facilities

By November 2017, less than half of facilities reported experiencing a stock out of amox DT in the past 90 days, representing a meaningful 23% (or 11 percentage point) decrease in stock outs, from 59% in March to 48% in November.[13] This result provides a measure of access to amox DT *over time*.

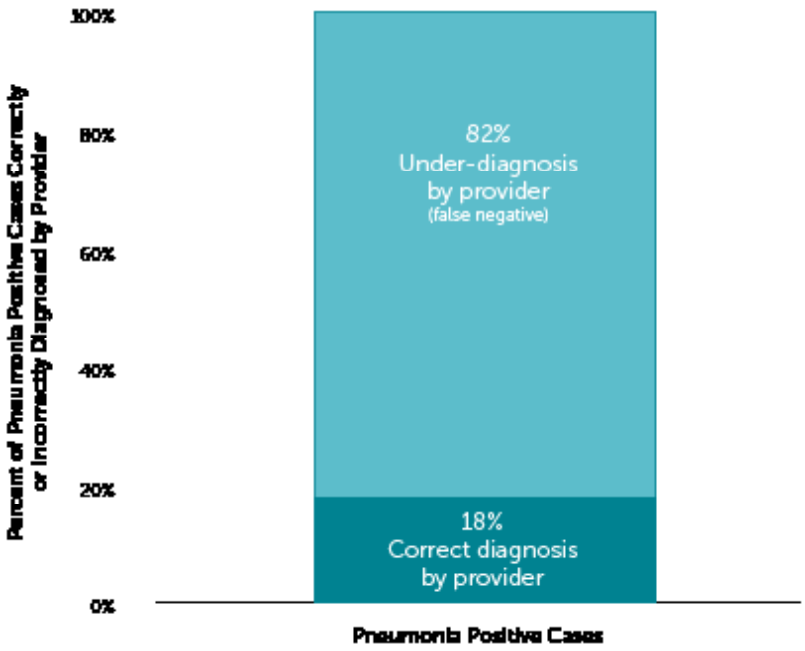
3. Health providers now prefer amox DT over other pediatric antibiotics for pneumonia

While only one quarter of providers in March 2017 identified amox DT as their preferred treatment for childhood pneumonia, by November 2017, more than twice as many, or 62%, preferred it.[14] Prior to 2015, the Tanzania Standard Treatment Guidelines recommended amoxicillin oral suspension (amox OS or "syrup") as the first-line treatment for childhood pneumonia. The substantial shift in provider preference toward amox DT is notable because it occurred alongside the 30% increase in amox DT availability and 23% decrease in stock outs, as reported above. Provider prescribing behavior is likely influenced by the medications they have available to them at their health facilities, and this important shift in preferences further suggests a correlation between having the drug available and prescribing it.

4. The majority of pediatric non-severe pneumonia patients are under-diagnosed for their illness

Providers gave a pneumonia diagnosis to only approximately one-fifth[15] of pneumonia-positive CU5 in public health facilities in the three regions where the pneumonia diagnosis and prescription study took place (see Figure 2).[16] This means that an estimated four out of five pneumonia patients, as confirmed by lung ultrasound, received a diagnosis other than pneumonia, reducing the likelihood that they received the medication they needed to treat their illness.

FIGURE 2: A LARGE MAJORITY OF CASES OF PNEUMONIA ARE UNDER-DIAGNOSED[17]



5. Providers are better at ruling out pneumonia and over-diagnose only a small portion of pneumonia-negative patients

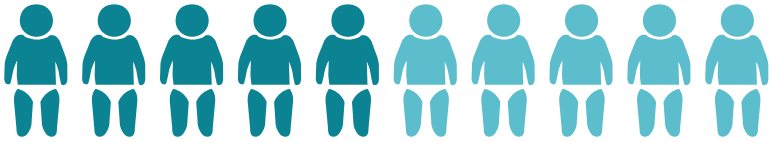
In the same study, **an estimated one in ten children without pneumonia (though with respiratory illness symptoms) were given a pneumonia diagnosis**.[18] A common assumption is that providers over-diagnose patients with pneumonia. However, as this finding and the one above show, *under-diagnosis* appears to be the more critical quality of care challenge, with providers often missing a large portion of the pneumonia cases that pass through their facilities.

6. Providers often skip steps recommended in the IMCI guidelines for diagnosing pneumonia, even when they know the steps they should carry out, suggesting a large "know-do gap"

Providers conduct clinical examinations[19] **on 33% of CU5 who present with respiratory symptoms.**[20] Therefore, for 67% of children with respiratory symptoms, providers are typically only asking questions to caregivers about their child's illness. **Furthermore, although 67% of providers identify that the patient's breaths should be counted for a full minute to diagnose pneumonia, they only perform this assessment for a full 60 seconds, as required by the IMCI protocol, in 7% of cases.** The discrepancy between the large percentage of providers who know they should be counting breaths, and the frequency with which they carry out this assessment, suggests an important gap between knowledge and action.

7. Providers are better at prescribing treatment when they have correctly diagnosed pneumonia

When providers accurately diagnose patients who have pneumonia, they perform better at prescribing the appropriate medication, with 72% of children in this category receiving a pediatric amoxicillin prescription.[21] **Conversely, providers prescribe pediatric amoxicillin to 46% of pneumonia patients who they diagnosed as having *illnesses other than pneumonia***. This suggests that if providers can reduce their misdiagnosis rates there would be substantial gains in overall treatment coverage rates for CU5 with pneumonia because provider prescribing behavior is more accurate when their diagnoses are correct. As a result of the two types of prescription behavior (correct diagnosis/correct prescription and incorrect diagnosis/correct prescription), about half of all pneumonia patients receive a pediatric amoxicillin prescription.

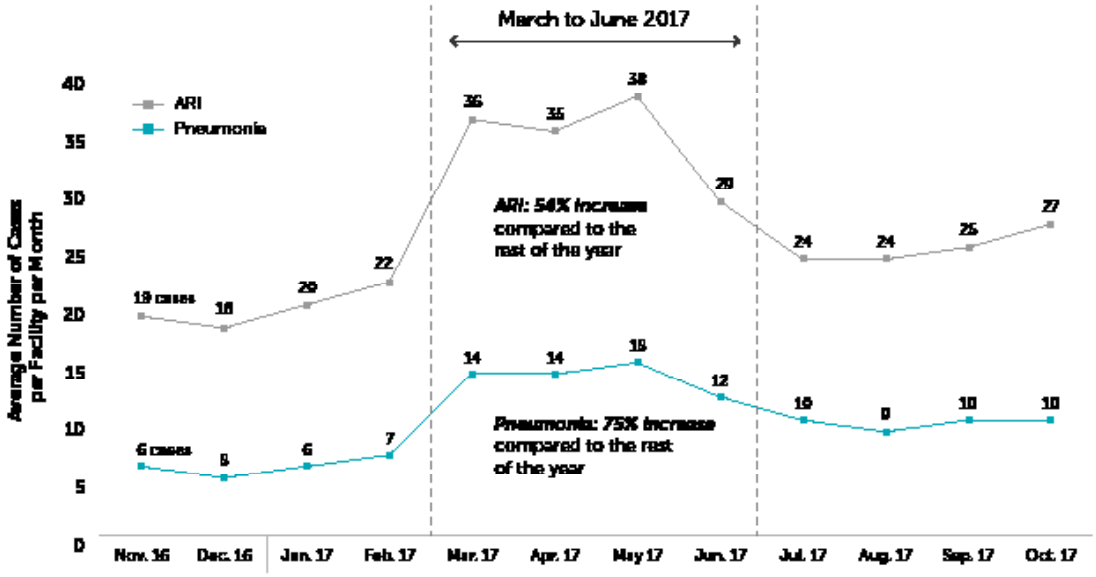


5 out of every 10 children who have pnuemonia are prescribed the pediatric amoxicillin treatment they need

8. Similar to malaria, pneumonia prevalence appears to be seasonal

Pneumonia data collected from health facility patient registers[22] indicates that pneumonia prevalence is seasonal from March to June.[23] The average number of pneumonia cases is 75% higher and the average number of acute respiratory infections (ARIs) is 54% higher during this period than the rest of the year (see Figure 3). Though the seasonality of pneumonia may vary by region across Tanzania, this period corresponds with the rainy season in much of the country.

FIGURE 3: THE NUMBER OF PNEUMONIA CASES PEAKED FROM MARCH 2017 TO JUNE 2017[24]



RECOMMENDATIONS

As outlined in this policy brief, the GoT and partners' actions to shape the market for amox DT and increase access to this lifesaving medicine has ensured that pneumonia treatments are available to more children when they need it. However, increasing the rational use of amox DT will also be critical to ensuring that increased treatment availability translates to reductions in child mortality. The following actions are recommended for the GoT and partners to sustain and build on the activities previously outlined, as well as to address the challenges related to rational use of amox DT:

1. Continue implementing market shaping activities, including sustainable financing and procurement, and increasing the robustness of quantifications to ensure consistent access to amox DT

The success of market shaping in Tanzania is reflected in the improved availability of amox DT at frontline points of care, with 30% more public health facilities having the commodity available in November 2017 compared to March 2017 (see Figure 1). Stocking of amox DT is also more consistent, translating into greater predictability of access at the point of care for both patients who seek care and the providers who treat them. Further market shaping activities, such as the following, would build on this progress:

- **Sustainable financing:** Alongside MoHCDGEC-R4D co-financing commitments through FY 2020/21, mobilize domestic resources to sustain efforts to fully transition amox DT purchasing from donors to GoT beyond 2021.

- **Sustainable procurement:** With MSD and relevant technical partners, continue identifying strengths and challenges in procurement mechanisms, and establish best practices to further increase availability of high-quality amox DT from 61% to near 100% levels, as seen for other essential medicines, such as artemether-lumefantrine (ALU, or Coartem).[25]

- **Evidence-informed national quantification and health facility forecasting:** With MoHCDGEC, MSD and technical partners, maintain efforts to continuously increase the rigor of national quantification by:
  - Consulting consumption and morbidity data.
  - Consulting international guidelines, country-experts and other high-quality data sources to ensure appropriate refinement of guiding assumptions.
  - Soliciting technical input for the continuous quality improvement of data systems.

2. Pneumonia seasonality requires further study and could be incorporated into forecasting and supply planning

In line with malaria seasonality, 2017 data showed that pneumonia may also have a seasonal peak between March and June, as the number of cases was 75% higher during this period than during the rest of the year. With this knowledge, health facilities should plan to have larger supplies of amox DT on hand to treat the greater CU5 pneumonia caseload they would expect to see during seasonal peaks.

To avoid potential stock outs, as part of the ongoing supply chain redesign, MoHCDGEC and MSD could:

- **Further validate the pneumonia seasonality trend from the health facility and private drug shop surveys:** This data could be triangulated with other national and regional data sets to determine whether the same trends around seasonality of pneumonia cases is demonstrated across multiple data sources.

- **Investigate incorporating seasonality into forecasting and supply planning by:** Building a mechanism in the ordering system (for example, in the Electronic Logistics Management Information System [eLMIS] or the Report and Requisition [R&R] forms) that considers seasonality and other trends that may inform seasonal consumption:

    - Facilities currently order medicines through the R&R form. The form uses the volume of a medicine dispensed in the previous three months to calculate the volume needed in the coming months. If pneumonia is seasonal, facilities would use less amox DT in the months prior to the peak pneumonia season. During peak season, ordered volumes would then potentially be less than actual need, potentially leading to stock outs.

3. Collaborate with partners to more rigorously test and further identify cost-effective, scaleable interventions to reduce high rates of pneumonia underdiagnosis

The high rate of pneumonia underdiagnosis points to a substantial gap in provider capabilities. Providers are often knowledgeable about the actions they should be taking to diagnose pneumonia, but knowledge often does not translate into action (or behavior). The GoT and partners tested the feasibility of implementing three cost-effective quality of care (QoC) interventions, which could support providers as they diagnose and treat patients. The interventions tested included remote clinical mentoring, clinical mentoring using case studies, mobile messaging and visual aids (in the form of job aids and posters). These activities, while conducted at a small scale, demonstrated the potential for important knowledge gains among providers who participated. However, translation of knowledge into practice needs to be further explored.

In the medium term, the GoT should continue to collaborate with partners to conduct further piloting of, and generate further evidence around, QoC interventions. Specifically, the GoT could:

- **Measure the potential impact of QoC interventions on provider behavior:** While improved knowledge is necessary for improved QoC outcomes, it does not guarantee action. Future studies should further identify and measure whether QoC interventions lead to improved provider behavior change.

- **Implement the interventions at a larger scale and measure effectiveness:** Before a nation-wide rollout of an intervention, the interventions could be rigorously tested by conducting an impact evaluation to ensure findings translate at scale.

- **Piloting and/or larger-scale implementation of the interventions could be integrated into existing programs:** Ongoing GoT programs focused on health care provider mentoring could serve as the platform for testing QoC interventions. This would ensure that the intervention design is complementary to existing programs.

- **The learnings from these evidence generation activities may have positive effects on the health system, extending beyond pneumonia or child health care:** Providers face challenges in diagnosing other illness that rely heavily on a correct understanding and consistent implementation of IMCI clinical steps. If provider accuracy in diagnosing pneumonia can be improved through the evidence generation activities described above, then provider accuracy in diagnosing other maternal, newborn and child health illness could be similarly improved.

NOTES

1. Government of Tanzania, Ministry of Health and Social Welfare, "Women and Children First: Countdown to ending preventable maternal, newborn and child deaths in Tanzania" (May 2015).

2. Amox DT is also the recommended first-line treatment for childhood pneumonia by the World Health Organization (WHO).

3. Pediatric amoxicillin refers to the two formulations of amoxicillin commonly prescribed for CU5: amox DT and amoxicillin oral suspension/syrup (amox OS).

4. USAID, "Evaluation of Country-level Constraints in Accessing Financing for the Procurement of Nationally Funded MNCH Commodities," Report (August 2015).

5. R4D procurement tracking data.

6. GoT stakeholders who participated in this effort included the Reproductive and Child Health Section (RCHS) of the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), President's Office - Regional Administration and Local Government (PO-RALG), Medical Stores Department (MSD), Tanzania Food and Drugs Authority (TFDA) and the Pharmacy Council. Results for Development (R4D) was the primary non-GoT partner contributing to these efforts. This work was supported by the Bill & Melinda Gates Foundation and Good Ventures.

7. Market shaping is an approach used by many actors across the global health sector to increase access to, and improve rational use of, essential products. Through in-depth market analysis, partners identify barriers to access to health products and implement strategies to reduce those barriers, thereby improving market efficiencies and ensuring that more high-quality products reach their intended users.

8. MoHCDGEC: Ministry of Health, Community Development, Gender, Elderly and Children.

9. Additional partners participating in the evidence generation activities described here include: National Institute for Medical Research (NIMR), Muhimbili University of Health and Allied Sciences (MUHAS), IDinsight and Economic Development Initiatives (EDI) Limited.

10. Results from a meta-analysis on the use of lung ultrasound showed that it has a sensitivity of 96% and a specificity of 93% as compared to chest x-ray: Pereda M, Chavez M, Hooper-Miele C, et al, "Lung Ultrasound for the Diagnosis of Pneumonia in Children: A Meta-analysis," *Pediatrics* (2015).

11. Health facility and private drug shop surveys (2017).

12. Medication is available in a health facility if at least one table of amox DT is available either at the dispensing window or in the stock room of the facility on the day of the survey. Statistical significance for the difference in availability between Round 1 and Round 3 is indicated with: * p-value <0.05; ** p-value <0.01; significance for the difference between Round 2 and Round 3 is indicated with: ^ p-value <0.05; ^^ p-value <0.01 (p-values have been adjusted via the Holm-Bonferroni method).

13. Health facility and private drug shop surveys (2017).

14. Health facility and private drug shop surveys (2017).

15. The precise numbers are being reviewed and analyzed and will be available in the first half of 2019.

16. Pneumonia diagnosis and prescription study (2017).

17. Pneumonia diagnosis and prescription study (2017). At each facility, one health care provider who was responsible for treating CU5 was randomly selected for the study. Survey interviewer directly observed provider patient consultations and recorded provider diagnosis; CU5 with respiratory symptoms or a respiratory diagnosis taken for lung ultrasound (LUS) examination and LUS result compared to provider diagnosis to determine accuracy; N = 847 CU5.

18. Pneumonia diagnosis and prescription study (2017).

19. Clinical examination refers to the completion of one or more of the three assessment steps providers should be undertaking when diagnosing a child under five according to the IMCI guidelines: 1) counting breaths, 2) looking for chest in-drawing and/or 3) listening to breathing for sounds of stridor or wheezing.

20. Pneumonia diagnosis and prescription study (2017).

21. Pneumonia diagnosis and prescription study (2017).

22. Recording information from the patient registers was a time-intensive process. Rather than record all cases of pneumonia in CU5 in the registers, the data collection team counted the number of cases during one full week of each of the four months prior to the day the survey took place in a facility. The weekly totals were then extrapolated by multiplying by 4.28 to reach an estimate of the monthly total cases of pneumonia per health facility.

23. Health facility and private drug shop surveys (2017).

24. Health facility and private drug shop surveys (2017).

25. Health facility and private drug shop surveys (2017).

ACKOWLEDGEMENTS

This project builds on the experience and expertise of many organizations and individuals working to reduce childhood mortality in Tanzania. R4D would like to thank all collaborators who are part of this project, including the following key partners:

Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), with special thanks to the Reproductive and Child Health Section (RCHS)

President's Office - Regional Administration and Local Government (PO-RALG)

Medical Stores Department (MSD)

Tanzania Food and Drugs Authority (TFDA)

Pharmacy Council

National Institute for Medical Research (NIMR)

Muhimbili University of Health and Allied Sciences (MUHAS)

IDinsight

Economic Development Initiatives (EDI) Limited

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