Cost Efficiency Analysis

Treating Severe Acute Malnutrition

In the past decade, the treatment of severe acute malnutrition (SAM) has dramatically shifted from an inpatient model of treatment to community management of acute malnutrition (CMAM) programs, where care is given to patients without complications on an outpatient basis through community centers. A number of studies have shown that outpatient therapeutic programs are more effective and cost effective than inpatient protocols, but most of these studies were undertaken in relatively stable low-income environments.[1] The International Rescue Committee (IRC), though, works in the most remote and fragile places in the world and seeks to understand how efficiently we can treat children with SAM in such extreme environments. Moreover, as the organization looks to expanding treatment for SAM in places that are too isolated or sparsely settled to access treatment centers, it is important to understand what factors drive the cost efficiency of outpatient-based CMAM programs.

The IRC's Best Use of Resources initiative team analyzed eight CMAM programs, looking at how variations in program features, as well as differences in the contexts in which these programs were run, impacted their cost efficiency. In each program, the IRC supported local Ministry of Health-affiliated clinics by providing management, staff, and supplies to existing health centers, nutritional therapeutic programs, and mobile health teams. These approaches enable the community-managed model of SAM treatment and offer more intensive inpatient care for the small proportion of children that require hospitalization. As more intensive inpatient care is a necessary component of CMAM, the costs of making inpatient care available for the most malnourished children are included in this analysis.

- **The IRC's SAM programs cost between $100 and $500 dollars per child treated.** The average cost per child treated was $235, excluding the shared costs of country office management, and $300 when said costs were included.

- **Among these center-based programs, cost efficiency is largely determined by contextual factors, suggesting that where a program is implemented causes greater differences in cost efficiency than how a program is implemented in a particular context.** The two major features driving cost efficiency in this analysis are the density of children in need of treatment in a health center's catchment area and the capacity of the national health system.

- **Understanding the 'scale' of a center-based nutrition program is complex, since the number of children reached depends on the population in the given area, the local malnutrition rate, and the treatment coverage rate—but two of these factors are determined by time and place.** It is important to focus on maximizing the number of children reached at existing centers by increasing coverage rates, since the costs of running CMAM programs scale with the number of centers operated. At the same time, some contexts will not be able to operate as cost-efficiently due to low population density or low SAM prevalence, and the cost efficiency of a CMAM program in a particular place may actually fall over time as it successfully brings down malnutrition rates.

- **Taken together, the results suggest that malnutrition treatment programs should be assessed relative to their potential cost efficiency if they achieved target coverage in that context, rather than comparing them to an absolute benchmark based on data from many countries.** In absolute terms, the CMAM program in Niger cost approximately $100 per child treated, while the programs in Mali cost between $100 and $300 per child treated. Since the malnutrition rate in Niger was much higher than in neighboring Mali, that program had the *potential* to reach more children, and be even more cost efficient, if it achieved higher coverage rates.

[1] Max Oscar Bachmann. "Cost–effectiveness of community-based treatment of severe acute malnutrition in children." Expert Review of Pharmacoeconomics & Outcomes Research. Vol. 10, Iss. 5. 2010.

Programs Included in this Analysis

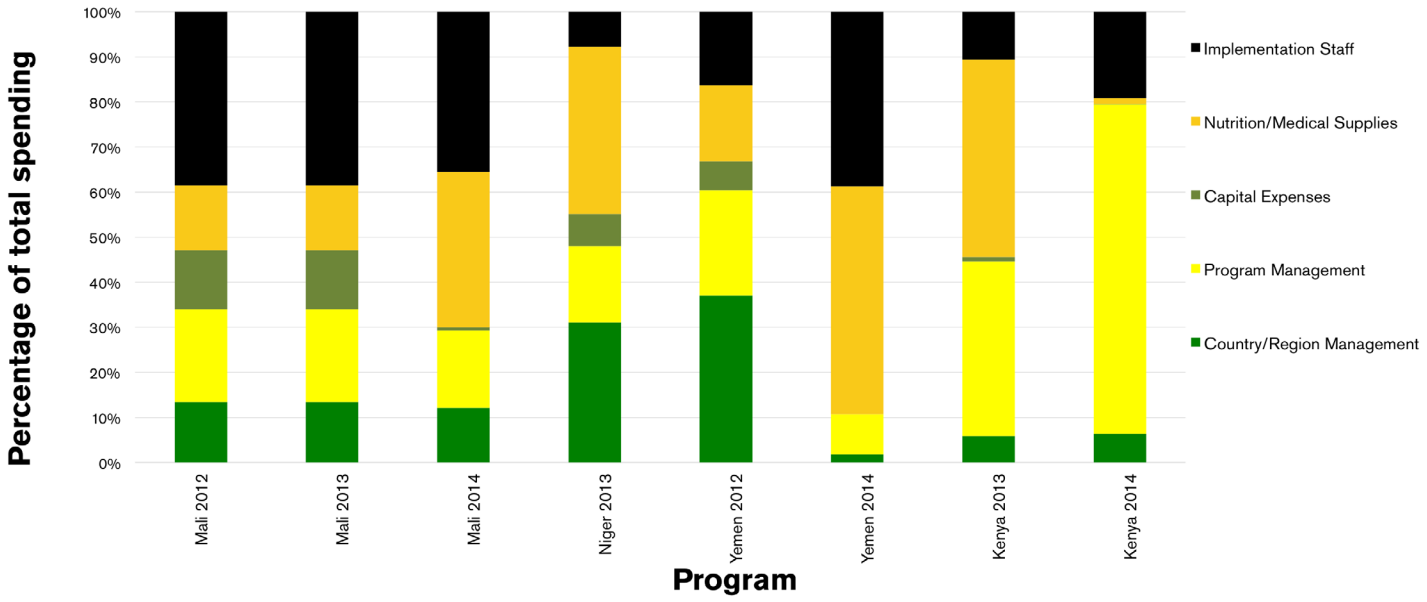
Country & Year	Region	Total Value of Grant	Spending on Nutrition Activities	Nutrition Costs as % of Total Grant
Mali 2012	Kati	$ 1,170,000	$ 933,088	80%
Mali 2013	Kati	$ 1,490,467	$ 964,360	65%
Mali 2014	Kati + Kalibancoro	$ 1,675,000	$ 759,533	45%
Niger 2013	Filingue	$ 1,235,781	$ 706,271	57%
Yemen 2012	Southern Yemen	$ 6,231,056	$ 280,543	5%
Yemen 2014	Southern Yemen	$ 134,000	$ 71,528	53%
Kenya 2013	Turkana West	$ 12,800,000	$ 556,033	4%
Kenya 2014	Turkana	$ 1,965,000	$ 501,214	26%

This analysis focuses on eight CMAM programs in the Sahel, East Africa, and the Middle East, where the IRC provided staffing, support, and supplies to existing government health infrastructure. In some cases, this meant providing bonuses and training for existing staff, while in other cases this meant hiring and paying staff directly, depending on the capacities and resources of the relevant health service. The government was also contributing funding to the participating health centers. As a result, this cost efficiency analysis should be interpreted as revealing the costs to the IRC of supporting government-implemented CMAM programs. IRC's support was higher in some programs than others, accounting in part for some of the variation in the costs of these programs.

These government health systems provided a full range of nutritional interventions, from CMAM programs to inpatient services for critically malnourished children or children suffering from malnutrition-related complications. It was impossible to neatly distinguish the costs of these two nutritional services in the data. In practice, the IRC always provides inpatient care facilities as part of CMAM programs for the children requiring more intensive care. For these reasons, the costs of making inpatient care available were included in the costing of the CMAM programs. The ready-to-use therapeutic food (RUTF) these programs distribute is, in almost all cases, donated for free by the U.N. Children's Fund (UNICEF), meaning the cost estimates do not include RUTF costs.

In part, donor requirements determine the amount of country management costs covered by their grant. This means that grant budgets do not necessarily represent the actual management costs for the program, creating a potential distortion from using grant budgets as the source of cost data. Therefore, program costs and cost efficiency are calculated both including (to accurately represent the resource costs of individual programs) and excluding (for making unbiased comparisons across programs) these shared costs.

Figure 1: Cost Breakdown by Category



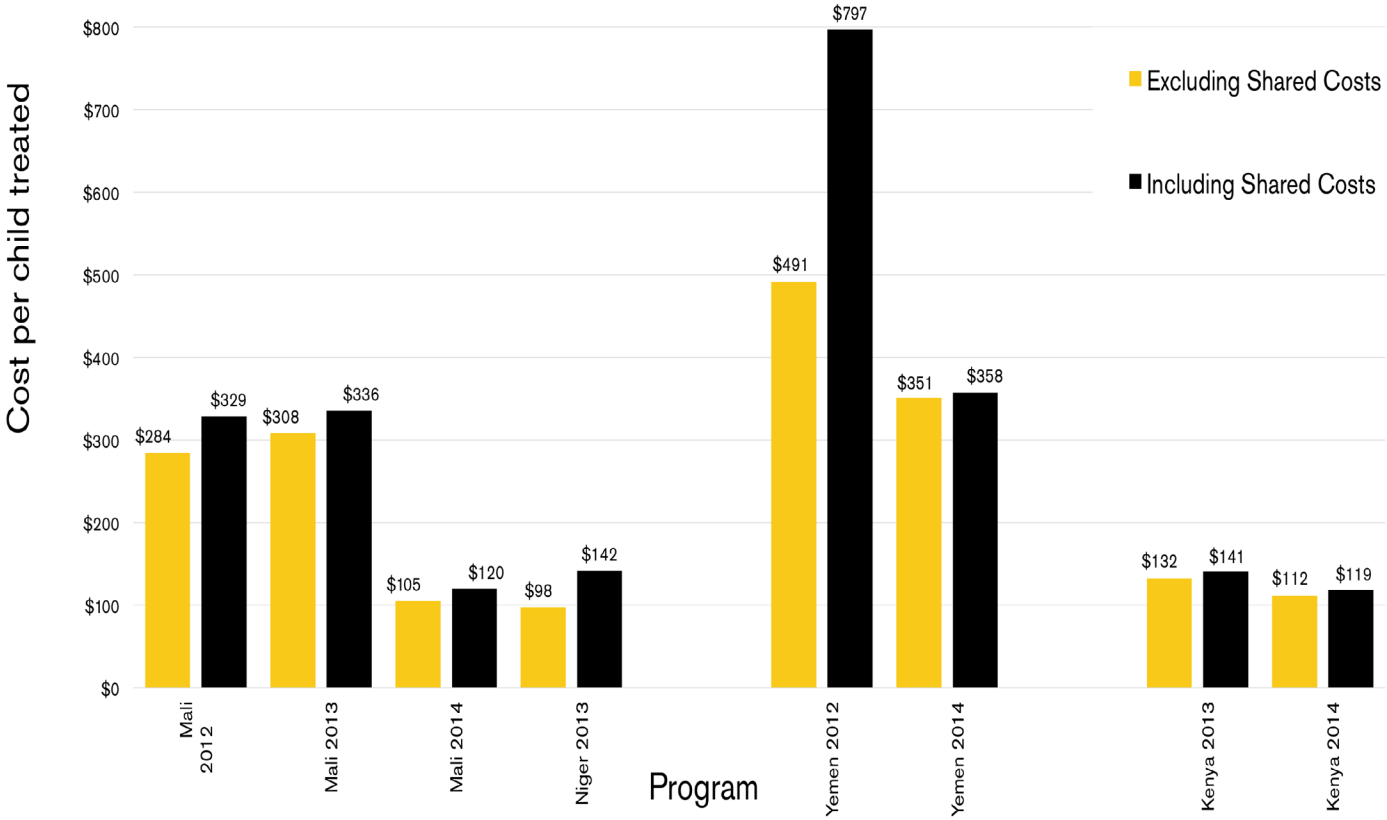
The cost of running a CMAM program depends on the number of centers operated more than the number of children treated at these centers; thus, program costs can be quite similar across programs, even when the number of children receiving treatment varies based on contextual features. In reporting the cost efficiency of these programs, the total costs of each program are compared to the program's 'output,' i.e. the number of children treated.[2] For some humanitarian programs, the number of outputs produced—i.e. the number of goods or services provided—is easily determined by that program's staff. For example, when running a cash transfer program in an emergency response, IRC staff are able to choose how many families they will target to receive the transfers. But for CMAM programs operated through existing government health centers, the number of children treated depends largely on factors that are fixed based on the operating context. As the table to the right shows, more children were in need of treatment in Niger than at any time in Mali, giving the Nigerien program the opportunity to spread its costs over a wider population, thereby lowering the cost per child.

SAM-Affected Children Reached: Population, Prevalence, and Coverage

Country & Year	Under-Five Population	SAM Prevalence	Period Coverage Rate	Children Covered
Mali 2012	112,207	2.8%	85.7%	2,838
Mali 2013	140,383	1.8%	77.8%	2,874
Mali 2014	196,585	1.8%	69.9%	6,324
Niger 2013	123,232	4.3%	31.8%	4,976

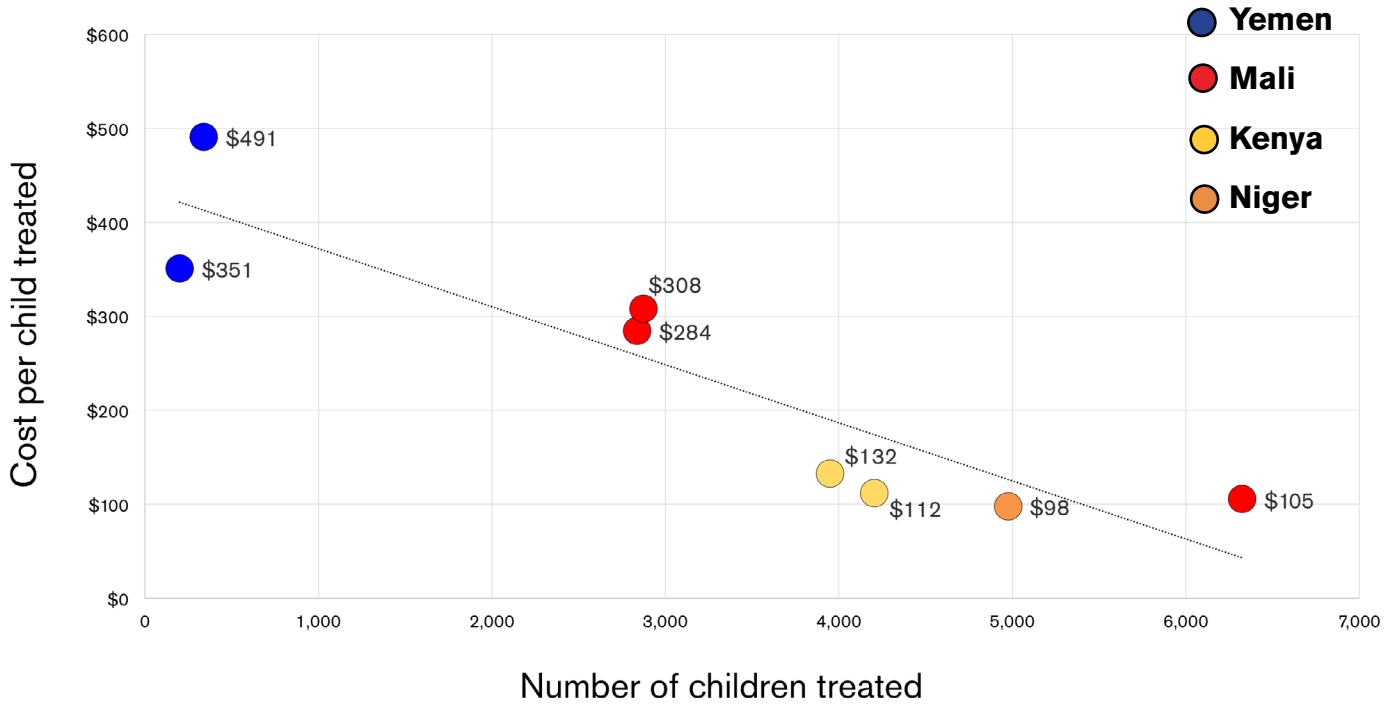
Combining financial information and monitoring data, the cost of IRC's CMAM programs is between $100 and $500 per child treated, averaging $250 per child treated (excluding shared costs of country management). When these shared costs are included, the cost per child ranges from $120 to $800, averaging $300 per child treated. In contrast to other cost efficiency analyses, relatively little variation exists in the cost per child of different CMAM programs in the same country. This supports the idea that, at least for center-based programs, contextual factors—such as population density and existing government health infrastructure capacity—drive much of the variation in cost efficiency.

Figure 2. Cost Efficiency of CMAM Programs



[2] In this cost efficiency analysis, "children treated" referred to the number of children admitted to a given facility during the year in question, who did not default (drop out of treatment before reaching recovery) during that time.

Figure 3. Cost Efficiency Vs. Scale



Cost efficiency is clearly linked to the scale that programs achieve. Yet, since some of the factors—population density and the prevalence of malnutrition—underlying scale are determined by context, programs in all areas are not expected to easily move up this scale. As the trend line in Figure 3 shows, when viewed across contexts the most cost efficient programs are those that achieve the greatest scale by serving the most children. Within particular contexts, however, the trend is not so clear; in Mali (red graph markers), greater scale was associated with greater cost efficiency, while in Yemen (blue graph markers), two programs treated very similar numbers of children, but had different cost efficiency ratios. Programs in a single context can make improvements to cost efficiency—such as by raising awareness about the dangers of malnutrition and the availability of treatment—and thus bring more children under coverage at existing centers. However, the cost efficiency of programs is limited based on demographic characteristics of the context.

Within a particular context, improving a program's cost efficiency is possible by improving treatment coverage of malnourished children through existing health centers. Given that the number of children treated at health centers is partially determined by population density and the prevalence of malnutrition, the only margin for changing the number of children treated is to increase the coverage rates—i.e. the proportion of children who have malnutrition whose families choose to seek treatment. This can be achieved by increasing the number of health centers, thus reducing the time and difficulty of travelling to receive treatment. However, decreasing marginal returns exist to opening new health centers; once an area is saturated, newly built centers will serve existing patients more conveniently but will not bring as many new children under coverage.

In addition, families face other barriers to accessing treatment that are not necessarily addressed by opening more centers. Parents may not be aware of the signs of malnutrition or the availability of treatment, families may face insecurity traveling even relatively short distances, and patients may not have confidence in the effectiveness of treatment methods. Better outreach—a relatively small cost compared to opening and operating a new health center—can address these factors. It is important to focus on increasing the proportion of children whose families decide to seek treatment at existing centers. Spreading the costs of operating existing centers across a larger number of children by increasing coverage rates in the catchment area of existing centers is the best way to improve the cost efficiency of programs within a single location.

Given that cost efficiency is largely determined by fixed features within an operating context, it makes sense to assess CMAM programs relative to their potential cost efficiency based on optimal coverage rates in that context, rather than comparing them to programs from other contexts. For example, the four Sahel programs in this analysis cost similar amounts per child with SAM treated—an average of $200. But the Niger program, run in a context with a much higher prevalence of SAM, had the potential to achieve much higher cost efficiency than the programs in Mali, if it reached similar coverage levels. Had the program in Niger managed to reach 70 percent coverage—the lowest of the three years of implementation in Mali—the program could have improved cost efficiency to between $60 and $90 per child treated.[3] Benchmarking programs to their potential cost efficiency based on contextual features, rather than an absolute line determined by cross-country averages, will both allow us to judge programs in sparsely settled areas with low government capacity more fairly and to push programs that operate in densely settled, high-prevalence areas to their maximum cost efficiency.

A new, non-center-based approach is needed to provide cost efficient treatment for SAM in the most remote and sparsely settled locations. The key to making nutrition programs cost efficient is to ensure that the denominator of the equation above—number of outputs—grows faster than the numerator; in other words, that program design changes increase the number of children treated faster than they increase the cost of the program.[4] Building additional centers to serve more sparsely settled areas will almost certainly not meet this criterion, suggesting alternative approaches are needed where costs scale with the number of children treated and not the number of geographic areas served. The IRC's nutrition team and Research and Development initiative staff are currently testing a model for low-literate community health workers to treat malnourished children in particularly remote areas.

How do you increase the cost efficiency of malnutrition programs?

# of Health Centers: Changeable, to a Point

One way to improve the number of children served is to increase the number of centers operated. However, there are declining marginal returns to more centers: eventually opening new centers will serve existing more patients more conveniently, rather than bringing new children under coverage.

Cost per Health Center: Set by Context

The cost per center includes the costs of paying for doctors, nurses, promoters, and supplies. The cost to the IRC of supporting a center will be different across contexts, but in a single context we are unlikely to be able to reduce the costs of operating already under-resourced centers.

$$\text{Cost per Child Treated} = \frac{\text{Total Cost}}{\text{\# of Outputs}} = \frac{\text{\# of Health Centers} \times \text{Cost per Health Center}}{\text{Population} \times \text{Malnutrition Rate} \times \text{Coverage Rate}}$$

Population: Set by Context

Across contexts, it makes sense to target places that are more densely populated, and therefore allow us to serve more people from a given health center. Within a single context, however, the population density is a major factor that affects cost efficiency but can't be affected by program activities.

Malnutrition Rate: Set by Context

It also makes sense to target places that have higher malnutrition rates, i.e. where the need for malnutrition treatment is greatest. Within a single context, however, the prevalence of malnutrition is a major factor that affects cost efficiency, but can't be affected by program activities.

Coverage Rate: Changeable

Within a particular context, the most powerful way to improve cost efficiency is to spread the costs of running health centers over more children by increasing coverage rates. This can be accomplished by opening more health centers, or by improving outreach at existing health centers.

[3] *With the assumption that variable costs scale at 1:1 or 1:2 with the number of children treated.*

[4] *The insight from the denominator of this equation is that programs in places with higher malnutrition rates will, all else being equal, be more cost efficient.*

Cost Analysis at the IRC

The IRC is committed to maximizing the impact of each dollar spent to improve our clients' lives. As the IRC's CEO wrote in a 2015 article in *Foreign Affairs*, "Donors need to not just double the amount of aid directed to the places of greatest need but also undertake reforms that seek to double the productivity of aid spending." The Best Use of Resource initiative is focused on improving the reach and impact of the IRC by using internally available data to better understand the cost of delivering key IRC interventions. Generating evidence about cost efficiency and cost effectiveness will enable the IRC to cost and compare different approaches and their related impact, ultimately allowing decisions that achieve the best use of resources.

"Cost efficiency analysis" compares the costs of a program to the outputs it achieved (e.g. cost per latrine constructed, or cost per family provided with parental coaching), while "cost effectiveness analysis" compares the costs of a program to the outcomes it achieved (e.g. cost per diarrheal incident avoided, cost per reduction in intra-family violence). Conducting cost analysis of a program requires two types of information:

1) Data on what a program achieved, in terms of outputs or outcomes, and
2) Data on how much it cost to produce that output or outcome.

Asking Ourselves "What Did a Program Produce?"

Units across the IRC produce a wide range of outputs, from obvious items like nutrition treatment or shelter kits to more intangible things like protection monitoring or case management. Cost analysis requires us to focus in on one output (for cost efficiency) or outcome (for cost effectiveness), such as the number of items produced or the number of people provided with a service. Such outputs will not necessarily encompass all the work that a program has done. For example, a WASH program may build water pipelines, latrines, and solid waste disposal pits; each of which could be defined as a single output. The Best Use of Resources initiative focuses on analyzing the IRC's key outputs, such as access to sanitation in refugee camps, malnutrition treatment, and case management services. The focus is not to dismiss other dimensions of our program's work, but to concentrate on one output, allowing for comparison of cost efficiency across programs and contexts in ways not possible if budget data at the program level was the only factor considered. The Best Use of Resources initiative team works together with IRC's Program Quality Unit to identify the most important outputs and understand how to quantify these outputs to improve the accuracy and efficacy of the results of analyses and use these improved results in programming decisions.

Asking Ourselves "How Much Did It Cost?"

After defining the output of interest, staff builds out a list of inputs that are necessary for producing that particular output. If one thinks of a program as a recipe, the inputs are all of the 'ingredients' necessary to make that dish. Budgets contain a great deal of information about the ingredients used and in what quantities, but a single grant budget will frequently cover several types of outputs, or program activities across multiple sectors. Therefore, not all line items in a program budget will be relevant to a particular output; to get an accurate sense of the costs of producing a particular output, staff categorize costs by the output they contributed to and count only those that are relevant to that particular output. Many of the line items in grant budgets are shared costs, such as finance staff or office rent, which contribute to an entire program's outputs. When costs are shared across multiple outputs, it is necessary to further specify what proportion of the input was used for the particular output. Specifying such costs in detail, while time-consuming, is important because it provides lessons about the structure of a program's inputs. We can divide costs into categories and determine whether resources are being allocated to the most important functions of program management, and enable us to model alternative program structures and quantify the cost implications of different decisions.

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