Final Evaluation of the Salud Mesoamérica Initiative: Impact of the Salud Mesoamérica Initiative on Reproductive, Maternal, and Child Health Outcomes
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Objectives

The Salud Mesoamérica Initiative (SMI) is a regional public-private partnership that brings together Mesoamerican governments, private foundations and bilateral and multilateral donors with the purpose of reducing health inequalities affecting the poorest 20% of the population in the region. Funding focuses on supply- and demand-side interventions, including evidence-based interventions, the expansion of proven and cost-effective healthcare packages, and the delivery of incentives for effective health services. One of its defining features is the application of a results-based financing (RBF) model that relies on performance measurement and enhanced transparency and accountability. The Initiative focuses its resources on integrating key interventions aimed at reducing health inequalities that stem from the lack of access to quality reproductive, maternal, neonatal and child health services (including immunization and nutrition services) for the poorest quintile of the population (1).

SMI employed a unique strategic approach to the implementation of results-based financing, focused broadly on evidence-based interventions from both a supply and demand side perspective. While outcome-level indicators defined in the regional performance framework prioritized maternal and child health coverage, quality, and effective coverage, results were expected and monitored along the continuum of pre-conceptional, maternal, neonatal, child, and sexual and reproductive health and in multiple areas of the health system. Crucially, indicators, targets, and interventions were defined collaboratively with each country in order to align with national context and priorities, rather than being prescribed by donors. Targets were negotiated between IDB and each country’s ministry of health to be challenging, but achievable and progressive.

In SMI’s intervention model, improvements in health system performance are expected to lead to improvements in healthcare coverage and healthcare quality, which can lead to impacts on population health (1). SMI attempted to improve reproductive, obstetric, neonatal, and child health outcomes by interventions such as provision of information and methods for contraception, active search of pregnant women, antenatal care with quality (and incentives for attendance), support of maternal waiting homes, birth plans and transportation for safe birth, active management of third stage of labor and proper patient management with partograph, management of obstetric complications, postpartum care to standard, active search of postpartum women, management of neonatal complications, routine neonatal care to standard, strategies for Comprehensive Child Care and communication, vaccination against serious diseases (improvements to cold chain and vaccine distribution), proper treatment of childhood illness such as diarrhea and pneumonia, regular deworming, micronutrient supplementation, and detection and treatment of anemia.

In this report, we explore the research questions, “What was the magnitude of change on maternal, neonatal and child health outcomes in SMI target areas, and to what extent can changes be attributed to SMI?” and “How did SMI influence changes in the coverage, quality of care and effective coverage indicators and in health systems performance?”. We examine the observed changes in Belize, El Salvador, Honduras, and Nicaragua over the period of the Initiative, consider the estimates in intervention areas as compared to comparison areas (where available),
and consider contextual factors such as the difference in health system structure from one country to the next and the COVID-19 pandemic.

Results of the second operation measurement for all eight participating SMI countries have previously been reported and made publicly available by IDB and IHME (https://www.healthdata.org/research-analysis/health-policy-planning/evaluations/smi). In this report, we focus on changes in the four countries that participated in the final operation in order to reflect on outcomes across all three SMI intervention cycles. The mortality analysis, qualitative analysis, and mixed-methods evaluation that accompany this report cover results in all eight countries (1-3).

**Methods**

The SMI study design provides representative estimates of the coverage of key health interventions and indicators for a geographic area that approximates the lowest wealth quintile of the population of each participating country. Administrative divisions, such as departments and districts, and subdivisions, such as municipalities, were purposefully selected for the SMI baseline based on documentation from the most recent available population census in each country. The third operation included four countries: Belize, El Salvador, Honduras, and Nicaragua. For all SMI countries except Honduras, IDB identified intervention subdivisions in which to conduct the baseline SMI survey for the Initiative on the basis of their high concentration of residents in the country’s lowest wealth quintile. In Honduras, a pool of eligible municipalities was identified based on economic conditions, and then the receipt of the intervention package was randomized by health system manager (“gestor”). Honduras municipalities that were not selected for the intervention package were selected to the comparison group. In Nicaragua (all measurement rounds) and El Salvador (at the third operation measurement only), comparison municipalities were identified by IDB based on similar socioeconomic characteristics and ethnic composition to the intervention municipalities. No comparison group was surveyed in Belize. For more information on sampling methodology for each country, see Chapter 2 of the respective Household and Health Facility Report of the third operation (4-7).

SMI was independently evaluated by IHME using a comprehensive selection of indicators defined by IDB and each ministry of health to measure the efficacy of interventions across the three operations of the Initiative. The set of indicators measured in each country varied based on the bespoke intervention packages furnished. The specific requirements of each indicator also varied according to country-specific standards of care, which were determined in cooperation with the respective national health authorities. IHME developed survey instruments to capture intervention outcomes from multiple areas of the health system. Health facility data collection was implemented in all four countries, including interviews of health facility representatives, physical observations of inputs such as equipment, medications, and vaccines, and systematic review of medical records. In El Salvador, Honduras, and Nicaragua, a survey of households measured household characteristics, reported maternal and child health data for women 15-49 years of age and for children 0-59 months of age, in addition to anthropometric measurements including height, weight, and hemoglobin concentration for children. In Belize, a Lot Quality Assessment Sampling survey conducted in intervention communities measured household characteristics and reported maternal and child health data for women 15-49 years of age and for children 0-59 months of age. The pairing of community and...
health facility surveys is a defining feature of the evaluation, designed to capture key indicators in a robust, multidimensional manner and permit the measurement of supply- and demand-side information on the Initiative.

Indicators defined by IDB were measured via surveys and calculated using bespoke programs constructed by IHME. Specific indicator definitions for each country are detailed in Appendix B of the respective Household and Health Facility Report of the third operation (4-7). Sample sizes for each survey conducted in countries participating in the SMI third operation are displayed in Table 1 below.

Table 1: Country measurement sample sizes

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Results & discussion

The following sections detail a selection of indicator results related to key SMI interventions conducted in countries participating in the third operation of the Initiative (Belize, El Salvador, Honduras, and Nicaragua). Indicators are included based on their status as performance indicators and/or their measurement in multiple participating countries, providing a varied examination of intervention outcomes across the continuum of reproductive, maternal, neonatal, and child health. For tables detailing performance across sub-component requirements for indicators in each country, please refer to Chapters 3, 4, and Appendix D of the respective Household and Health Facility Report of the third operation (4-7).

Reproductive health care

Use of modern contraceptive methods

Use of modern contraceptive methods was measured in household and community surveys across all four participating countries. Modern contraceptive methods typically include injectables, female sterilization, male sterilization, oral contraceptives, intrauterine device (IUD), contraceptive implant, condoms (male or female), diaphragm, sponge and spermicide, and emergency contraception. The indicator is measured among married or partnered women aged 15-49 years.

Figure 1: Use of modern contraceptive methods (2010, household and community survey)
While Belize, Honduras, and Nicaragua showed marginal improvements over the baseline measurement, in general the proportion of respondents using modern contraceptive methods did not change substantially over time in any country. Observed differences were often within the range of the 95% confidence intervals. Contraceptive use depends largely on behavioral norms and may be subject to circumstances outside the scope of SMI interventions. In addition, access to contraceptive methods that require regular visits to health facilities (for example, injection, oral contraceptives or condoms) may have been impacted by the COVID-19 pandemic.

**Cervical cancer screening**

Recent SMI interventions aimed at increasing cervical cancer screening were measured through novel performance indicators in each of the four countries. In El Salvador, Honduras, and Nicaragua, interviewers systematically selected routine care medical records of women from ambulatory facilities to evaluate the presence and quality of cervical cancer screenings, and in the case of positive screening results, appropriate followup actions taken. In Belize, community survey respondents were asked about their recollection of various types of screenings as well as whether the results of those screenings were known to the respondent at the time of the interview.

*Figure 2: Cervical cancer screening with quality (6005, medical record review)*

Both Honduras and Nicaragua measured higher proportions of cervical cancer screenings with quality in intervention areas than comparison areas, while El Salvador had nearly identical proportions. For the cervical cancer screening with quality indicators measured via medical records (El Salvador, Honduras, and Nicaragua), fairly large proportions of records met the indicator providing evidence that SMI interventions and/or external factors have supported the wide uptake of cervical cancer screening. Belize showed a decrease in self-reported cervical cancer screening in the third operation.

**Obstetric care**

**Preconception care with quality**

Recent SMI interventions related to preconception care implemented in Belize and El Salvador were measured via a novel performance indicator. Antenatal care records at ambulatory facilities were evaluated for the presence of at least one preconception care visit, wherein various vital checks, lab tests, and risk factor management practices were to occur prior to pregnancy. In Belize, no preconception care visits were recorded among records collected. In El Salvador, one visit was registered, but no further information on care conducted was observed in the record. This might suggest that though the implementation of the intervention was underway, record keeping practices were not yet adapted to inclusion of information regarding preconception care visits.
Antenatal care with quality

Antenatal care quality was an important priority of SMI. Medical records from all four participating countries were evaluated for various aspects of quality antenatal care, including minimum number of visits, timeliness of the first visit, checkups performed at each visit, and lab tests performed at least once during the pregnancy.

*Antenatal care requirements vary according to country-specific standards. El Salvador and Nicaragua require at least 4 visits; Honduras and Belize require at least 5 visits. El Salvador indicator includes additional requirements of the management of risk factors and tetanus vaccination.*

In Honduras, quality antenatal care improved markedly in intervention areas from the baseline through the second operation, surpassing performance in comparison areas that outperformed intervention areas at baseline but did not show comparable improvement over time. While performance decreased in the third operation in Honduras intervention areas, possibly as a consequence of the COVID-19 pandemic, the proportion of records demonstrating quality antenatal care still outperformed comparison areas, demonstrating that SMI interventions may have contributed to resilient antenatal care practices.

Other countries struggled to improve quality antenatal care across measurement periods, and in the case of Nicaragua, regressed in intervention areas since the baseline; Nicaragua comparison area performance improved from the second to third operations. A lack of required lab tests contributed to intervention area declines in performance in Nicaragua. In Belize, lab test performance improved notably over the baseline, however, performance was hampered by a lower proportion of records with at least four antenatal care visits, suggesting that reduced care seeking during the pandemic may have influenced the result. Improvements in the provision of
appropriate lab tests despite the burdens on the health system due to the pandemic is nonetheless an important indication of quality antenatal care in Belize. In El Salvador, a combination of inconsistent hemoglobin tests and a lower proportion of records with the required number of visits contributed to stagnant results across measurement periods (4-7).

The results suggest room for further investment in antenatal care practices across countries given the relatively low performance of the quality antenatal care indicator in the third operation measurement. A lack of consistent record keeping has been identified as a gap in antenatal care practice. The distinction between whether a vital check or lab test was not performed or whether it was performed and not marked in the medical record should be noted; we cannot know which is driving poor performance without better record keeping practices. Understanding this distinction will have important implications for the consideration of future interventions related to quality antenatal care.

**Institutional delivery with skilled personnel**

Respondents in household and community surveys who had given birth in the past two years attested to characteristics of their most recent delivery. The SMI indicator measuring institutional delivery with skilled personnel provides insight into whether proper medical attention and hygienic conditions existed during delivery, which can reduce the risk of complications, infections, and even death for the mother and newborn baby. Institutional delivery is usually characterized as having occurred in a hospital or facility with equivalent capacity to conduct routine delivery care, while skilled attendance of the delivery requires the presence of a doctor, nurse, or equivalent medical professional.
In Belize and El Salvador, institutional delivery with skilled personnel remained at high levels observed at baseline and second operation measurements, with all estimates in intervention areas exceeding 95%. In Honduras, a noted increase from baseline to second operation plateaued through the third operation, but outperformed a smaller increase in comparison areas. In Nicaragua, institutional delivery with skilled personnel remained virtually unchanged at just under 90% from baseline through the third operation despite modest improvement in comparison areas, suggesting barriers to increasing institutional delivery beyond this high threshold may exist outside of the scope of SMI interventions.

Management of obstetric complications

In all four countries, interviewers evaluated records of obstetric complications that were systematically sampled by IHME in each country. These records were used to evaluate quality of care, as defined by the obstetric complications performance indicator 4080 of each country.
An overall positive trend can be seen in most intervention area measurements as SMI progressed, with the exception of El Salvador which was found to be consistent across operations. Comparison areas had an overall increasing trend in Honduras, and fluctuated slightly in El Salvador and Nicaragua. A common pattern was a slight decrease between the third operation’s pre-evaluation and evaluation measurement periods, which might be explained by an increasing burden from the COVID-19 pandemic. Additionally, in almost all rounds with available comparison area data, intervention areas outperformed comparison areas, which breaks from the trends found in other indicators included in this report. Differences in estimates between comparison and intervention areas were statistically significant at the 95% level by the third operation in Honduras and Nicaragua, though estimates were also higher in intervention areas at the baseline. However, performance not exceeding 70%, and much lower in El Salvador, show that there still remains substantial room for future improvement in the management of obstetric complications.

**Postpartum care with quality**

In Belize, El Salvador, and Nicaragua, postpartum care medical records were evaluated for standards for appropriate postpartum care (PPC). The indicator requires that certain checks be performed within the first hours after delivery and at discharge.
Results were mixed across countries for this indicator, with intervention and comparison area results closely matching within each country. Belize and Nicaragua saw a general and slight uptrend across measurement rounds. No records passed the indicator in El Salvador at the first operation; a large increase in the second operation was followed by a sharp regression to near first operation levels in the third operation. The postpartum transportation strategy SMI intervention, unique to Nicaragua, may provide context for the higher levels of success observed there in both intervention and comparison areas relative to other countries. However, high performance in Nicaragua’s comparison areas may point to success caused by factors external to SMI.

**Neonatal care**

**Management of neonatal complications**

In all four countries, interviewers evaluated records of neonatal complications that were systematically sampled by IHME in each country. These records were used to evaluate quality of care, as defined by the neonatal complications performance indicator 4070 of each country.
*Neonatal complications management requirements vary substantially according to country-specific standards. In Honduras, neonatal complications management is only evaluated at complete level facilities. In Honduras, low birth weight cases are not evaluated among neonatal complications. Some records were evaluated for multiple neonatal complications.

Among all indicators explored here, evidence of strong improvement in intervention areas for all countries is most pronounced in the management of neonatal complications. Intervention area increases were largely attributable to improvements in lab tests conducted, particularly glycemia measurements. Other drivers of progress included routine checks such as respiratory rate in Belize, Silverman-Anderson test in Nicaragua, and heat application and breastfeeding for asphyxia and low birth weight cases in El Salvador. A similar upward pattern appears in both El Salvador’s and Honduras’ comparison areas, while Nicaragua’s comparison areas fluctuated near its baseline measurement. Gains in comparison areas may be due to spillover SMI impacts, factors external to SMI interventions, or a combination of both. SMI interventions related to neonatal care such as clinical management of neonates and improvement of referral mechanisms may have contributed to growth in the management of complications. Despite sustained improvement, third operation estimates below 70% indicate an opportunity for continued improvement in the management of neonatal complications.

**Routine newborn care with quality**

In Honduras and Nicaragua, interviewers reviewed immediate postpartum records from uncomplicated deliveries in the past two years at basic and complete facilities to evaluate immediate routine newborn care. Neonates must receive all appropriate checks and procedures according to the standards defined by the quality routine newborn care performance indicator 4103.
Routine newborn care requirements vary according to country-specific standards: Nicaragua requires the curing of the umbilical cord with chlorhexidine and water while Honduras does not. Honduras requires temperature check while Nicaragua does not. In Honduras, the BCG vaccine is only required for neonates weighing more than 2500 grams.

Both Honduras and Nicaragua measured early improvements in the first operation intervention areas. From there, Honduras intervention areas maintained improvements while Nicaragua’s improvements faded. The strong initial improvement in both countries suggest that early intervention practices may have been effective, but perhaps lacked sustainability. Nonetheless, the performance level maintained in intervention areas of both countries from second to third operations was not matched in comparison areas, which regressed in both countries, suggesting that SMI interventions may have contributed resilience to overburdened health systems during the pandemic.

Skilled neonatal care

In El Salvador, Honduras, and Nicaragua, household survey respondents attested to the care received by neonates in the days following delivery for the most recent birth in the last two years. The indicator requirements vary by country in terms of the time window for care: seven days in El Salvador, three days in Honduras, and 10 days in Nicaragua. Skilled attendance by a doctor, nurse, or equivalent medical professional is also a requirement of the indicator.
Performance in all three countries failed to make substantial gains across measurement periods. In Honduras, intervention area performance at the third operation was relatively unchanged after a decrease from baseline to second operation. El Salvador performance decreased slightly from second to third operations, while in Nicaragua, the third operation results reversed a slight decline observed at the second operation, returning to around baseline levels and failing to match the round-to-round improvement seen in comparison areas. Given that neonatal care visits often require a return visit to a health facility soon after delivery, it is possible that reduced care seeking and altered behaviors due to the pandemic prevented meaningful improvement in the third operation.

**Child health**

**Anemia prevalence**

Anemia is a condition characterized by low concentration of hemoglobin in the blood, a concern particularly for children because it is associated with impaired brain and motor development. Common causes of anemia include inadequate intake of iron, folate, vitamin B12, or other nutrients. Administration of deworming treatment, a focus of SMI interventions in all four countries, and intake of micronutrient packets, a focus of interventions in El Salvador, Honduras, and Nicaragua at the second operation, have been shown to reduce the prevalence of anemia.
in children. Hemoglobin levels were captured from children ages 0-59 months as a component of the anthropometric measurements conducted during the household survey in El Salvador, Honduras, and Nicaragua. Children with hemoglobin levels of <11.0 g/dL were considered anemic. In Honduras and Nicaragua, the cutpoints for anemia were adjusted (raised) in settings where altitude is more than 1,000 meters above sea level to account for lower oxygen partial pressure, a reduction in oxygen saturation of blood, and an increase in red blood cell production. Results of the anemia prevalence indicator are displayed in the figure below for children ages 6-23 months. Note that lower prevalence values are positive outcomes.

Figure 11: Children (6-23mo) with hemoglobin <110g/L (1060, household survey)

*El Salvador anemia threshold was not adjusted for altitude >1000m in order to maintain comparability with baseline measurement. In Honduras and Nicaragua, the anemia threshold was adjusted for altitudes above 1000m.

In Nicaragua, anemia prevalence remained at approximately 50% across measurement rounds, with differences falling within 95% confidence intervals. This stagnation was mirrored in comparison areas. In El Salvador and Honduras, anemia rates fell notably from the second to third operations, reversing an increase in anemia observed between the baseline and second operation in Honduras. Anemia rates in Honduras were higher in comparison areas than intervention areas, a difference that was more pronounced in the second and third operation than the baseline. The anomalously high estimates at the second operation in El Salvador and Honduras, as well as in certain countries that did not participate in the third operation, suggest there may be important unobserved factors that influenced anemia estimates across rounds.
Diarrhea treatment

Dehydration caused by severe diarrhea is a major cause of morbidity and mortality among children. A simple and effective response to dehydration caused by diarrhea is a prompt increase in the child’s fluid intake through some form of oral rehydration therapy (ORS). Other treatments, including zinc, may be administered as well. The distribution of ORS and zinc to treat child diarrhea was an intervention conducted in all four countries participating in the SMI third operation. The prevalence of diarrhea was estimated by asking caregivers whether their child had diarrhea in the two weeks preceding the interview. If the child had diarrhea, the caregiver was asked about treatment and feeding practices during the diarrheal episode. The indicator requires administration of both ORS and zinc.

Figure 12: Diarrhea treatment with ORS and zinc (5060, household and community survey)

All four countries struggled to demonstrate meaningful improvement in diarrhea treatment, with no intervention areas reaching above 20% in performance at the third operation measurement. In El Salvador, performance regressed relative to the second operation. In Honduras and Nicaragua, performance increased marginally over very low values observed at the baseline, yet neither surpassed 15% successful treatment. In El Salvador and Nicaragua, intervention area results were eclipsed by the comparison area. Despite these findings, there may still be reason to believe diarrhea treatment interventions may have had some success in SMI countries: in all four, ORS were widely administered in over 50% of cases, and poor performance can be attributed mainly to a lack of zinc administration (4-7). This suggests a clear opportunity for further improving diarrhea treatment.

*Age eligibility varies: Belize, Honduras, Nicaragua: 0-59 months; El Salvador: 6-59 months.
Complete vaccination for age

Information on immunization coverage was collected on children 0-59 months whose caregivers participated in the household or community survey in each of the four countries. SMI interventions focused on improving outcomes related to preventable diseases in children (AIEPI), vaccine cold chains (Nicaragua), and community vaccine distribution (Nicaragua and El Salvador). Measurement of vaccination for age from the household and community surveys varied by country: in Belize, vaccination was based on caregiver recall, while in other countries a combination of vaccine card and recall data were used based on availability. Vaccination requirements for different age groups also varied according to country based on the respective national vaccination schemes. For details on the specific requirements for complete vaccination for age in each country, see Appendix B of the respective Household and Health Facility Report (4-7).

Figure 13: Complete vaccination for age (5020, household and LQAS survey)

*Belize measurement utilized caregiver recall only while El Salvador, Honduras, and Nicaragua utilized vaccine card OR caregiver recall. See Household and Health Facility Surveys reports for full list of vaccine requirements.

In Belize, the proportion of children with complete vaccination for age quadrupled since the second operation, an impressive result given the context of the COVID-19 pandemic. The effects of the pandemic may have been more pronounced in other countries, where the third operation measurement failed to show substantial improvement over the second operation results. In Nicaragua, intervention areas lagged behind comparison area in terms of vaccination for age, but increased slightly in both areas at the third operation. In Honduras, comparison areas regressed to the baseline level by the third operation, while intervention areas managed to sustain improvement over the baseline despite regressing since the second operation. This suggests a resilient immunization program.
may have been fortified as a result of SMI interventions, contributing to improved outcomes despite the pandemic.

Data for decision-making

As part of a new performance indicator implemented to measure interventions conducted during the SMI third operation, facilities in Belize, El Salvador, and Nicaragua were evaluated on their capacity to use data for decision-making related to management of obstetric or neonatal complications. Specifically, administrative records and staff meeting notes were reviewed for the identification of gaps related to complications management such as lack of supplies, training of personnel, information system registration, or other management aspects.

Figure 14: Use of data for decision-making (7500, health facility observation)

![Data for decision-making chart]

*Use of data for decision-making requirements vary according to country-specific standards. This indicator is evaluated at ambulatory facilities in El Salvador and hospitals in Belize and Nicaragua.

El Salvador and Nicaragua both measured similar results among their intervention and comparison area facilities, with slightly higher proportions in comparison areas. With all countries showing that at least half of the measured facilities met the indicator, there is evidence that SMI interventions and/or external factors are supporting the wide utilization of data for decision-making.
Conclusions

For many indicators across the continuum of care, we often observe only marginal differences over time and relative to the comparison group, for example, in use of modern contraceptive methods, institutional delivery in Belize, El Salvador, and Nicaragua, postpartum care with quality and neonatal follow-up visit, adequate treatment of diarrhea, and vaccination coverage.

However, certain indicators did show better performance in intervention areas than comparison areas (although baseline differences in characteristics between intervention and comparison are known). These include cervical cancer screening in Honduras and Nicaragua, and antenatal care with quality in Honduras.

For a few indicators, we do observe substantial increases over time and relative to comparison areas, for example, institutional delivery in Honduras, and obstetric and neonatal complications management in Belize, Honduras, and Nicaragua.

The four countries that participated in the third operation faced major barriers to achievement of progress on the indicator framework, primarily due to direct and indirect challenges of the COVID-19 pandemic. These include diversion of resources in the health system, reduced careseeking due to public health orders reducing mobility or to fear of infection, and general economic impacts affecting both supply (shortages of inputs for health facilities) and demand (reduced incomes and inflation affect ability to pay for costs associated with seeking medical care). Nevertheless, each country showed some achievements relative to the second operation, which indicates that SMI may have contributed to health system resilience.

References

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**About IHME**

The Institute for Health Metrics and Evaluation (IHME) is an independent population health research center at UW Medicine, part of the University of Washington, that provides rigorous and comparable measurement of the world’s most important health problems and evaluates the strategies used to address them. IHME makes this information freely available so that policymakers have the evidence they need to make informed decisions about how to allocate resources to best improve population health.

IHME aspires to make available to the world high-quality information on population health, its determinants, and the performance of health systems. We seek to achieve this directly, by catalyzing the work of others, and by training researchers as well as policymakers.

Our mission is to improve the health of the world’s populations by providing the best information on population health.

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