# SHELTER, SETTLEMENT AND HEALTH ALONG THE U.S.-MEXICO BORDER

## A LATIN AMERICAN CASE STUDY INVESTIGATING THE RELATIONSHIP BETWEEN SHELTER AND SETTLEMENT ASSISTANCE AND HEALTH OUTCOMES IN FORMAL AND INFORMAL CAMPS

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## INTRODUCTION

This research contributes to the growing body of work that examines the relationship between shelter and settlement (S&S) assistance and health outcomes among vulnerable communities in humanitarian crises. Focusing on case studies drawn from formal and informal camps along the US-Mexico border in Reynosa, Tamaulipas, Mexico, the study analyzes three primary sites: Plaza de la República ("The Plaza"), Senda de Vida II ("Senda II"), and the Rio Camp ("Rio"). These sites offer a lens through which to investigate how U.S. immigration policies, such as the Migrant Protection Protocols (MPP), Title 42, and Title 8, directly influence the formation, organization and conditions of these settlements as part of a broader borderland urban landscape of displacement. The study explores the connection between policy and spatial development, revealing how migration policies shape not just the movement of people, but the physical spaces they occupy.

## METHODOLOGY

In order to best understand space programming in formal and informal settlements in Northern Mexico, a mixed-methods qualitative approach was used to explore the complex set of factors surrounding the expansive and permanently transient phenomenon of three case studies: The Plaza, Senda II and Rio. Drawing on geospatial data alongside traditional qualitative sources enables engagement with emerging approaches to mapping, modeling, and data management in shelter and settlement research[1]. Through mapping and qualitative interviews taken in July 2023 with women in Senda II and Rio, social complexities, as well as the site's physical attributes, are observed and analyzed to address the wider impact of shelter and settlements on migrant communities along the U.S.-Mexico border.

Case study mapping was conducted using monthly drone imagery, AutoCAD, and Adobe software. Drone data provided by an implementing partner was cross-referenced with population estimates to analyze changes in density between 2021 and 2023. From these density calculations, per-capita access to public and play space was assessed and compared against Sphere standards and other camp planning guidelines. This spatial analysis visualizes settlement visualizes growth patterns, materiality and scale of temporariness.

The qualitative interviews, conducted in July 2023, explored the experiences of migrant women living in Senda II and Rio. Sixteen women participated across two sites. Ten women of varying ethnicities and shelter typologies were interviewed at Senda II, while six Haitian women living in tents were interviewed at Rio. Thirteen participants reported having children, providing insight into how families experience children's infrastructure, public space, and daily life within these settlements. Rather than serving as a statistically representative sample, the interviews

1 GSC, 2018, p. 160


*Figure 1: Figure linking U.S. policies to the creation and closure of formal and informal settlements in Tamaulipas, Mexico. Elaborated by: Author, 2023*

provide contextual understanding that complements the spatial analysis, illustrating how settlement design influences everyday experiences of migrant communities.

This study is subject to several limitations. High population turnover within both settlements meant that spatial and demographic conditions were fluid and continuously changing, limiting the ability to capture a stable population baseline. As a result, drone imagery and population estimates represent temporal snapshots rather than fixed conditions. Additionally, access constraints and on-site conditions influenced participant availability, meaning interviews reflect those present at the time of data collection rather than the full diversity of settlement residents.

## .BACKGROUND AND RATIONALE

Figure 1 shows the direct correlation between policy development and settlement development. Compared to prior in-country border management approaches, both MPP and Title 42 represented contentious shifts toward externalized and expedited containment policies. These policies provoked political debate and left thousands of migrants vulnerable, contributing to the emergence of new unsanitary, unsafe and insecure settlements. The onset of MPP led to what is now considered "the first refugee camp on the U.S.-Mexico border," the Matamoros Camp[2]. The Matamoros Camp is the only site among those studied that received sustained international attention and documentation from media, humanitarian organizations and policymakers, becoming so visible that the Biden administration vowed to close the camp upon election, as it "was a powerful symbol of the humanitarian impact of policies enacted by the administration[3]". Post the Biden administration's initial suspension of the camp, it was bulldozed as the remaining migrants crossed, but within that same month, a new settlement "sprang up about 55 miles farther west, in the Mexican city of Reynosa," La Plaza de la Republica, or "the Plaza." The following case studies are explored: The Plaza, Senda II and Rio; the creation and closure of all three camps are directly correlated to U.S. policy and each other, as seen in Figure 1 next page.

Using drone imagery, the development of these settlements has been mapped since 2021, with monthly data maps that reveal key trends in density, materiality, and the transient nature of the settlements. By mapping settlement growth, the research visualizes key elements of temporariness and how the lack of long-term planning contributes to overcrowding, substandard living conditions, and increased health risks. This spatial data is cross-analyzed with population estimates and compared to international standards for humanitarian assistance, including Sphere Standards, UNHCR's emergency indicators, and the European Committee for the Prevention of Torture and Inhuman or Degrading Treatment or Punishment (see Figures 2 and 3).The CPT standards are reserved for incarcerated adults not for children, however the study makes a stark comparison: asylum-seeking children have less space to live than prisoners under international guidelines (see Figure 4). This highlights the critical need for improved shelter design and policies that address overcrowding.

2 Jordan, 2021, para. 2

3 Jordan, 2021, para. 2

| EXISTING CONDITIONS: site m² | | | | | | |
|---|---|---|---|---|---|---|
| | **Sphere Guidelines** | **UNHCR Emergency Indicator** | **CPT Standards** | **The Plaza** | **Senda de Vida II** | The Rio **Camp** |
| 1 person | 45 m² | 30 m² | 4 m² | | | |
| 500 people | 22,500 m² | 15,000 m² | 2,000 m² | 6,500 m² | 11,650 m² | 2,500 m² |
| 1,000 people | 45,000 m² | 30,000 m² | 4,000 m² | 6,500 m² | 11,650 m² | **2,500 m²** |
| 1,500 people | 67,500 m² | 45,000 m² | 6,000 m² | 6,500 m² | 11,650 m² | |
| 2,000 people | 90,000 m² | 60,000 m² | 8,000 m² | 6,500 m² | 11,650 m² | |
| ,2500 people | 112,500 m² | 75,000 m² | 10,000 m² | 6,500 m² | 11,650 m² | |
| 3,000 people | 135,000 m² | 90,000 m² | 12,000 m² | **6,500 m²** | **11,650 m²** | |
| ,3500 people | 157,500 m² | 105,000 m² | 14,000 m² | | | |

*Figure 2: Figure comparing existing settlements' sizes (m2) to UNHCR and CPT standards. Elaborated by: Author, 2023. Data from: (CPT, 2015; Sphere, 2018; UNHCR, 2007) and Solidarity Engineering drone data collection*

| EXISTING CONDITIONS: m²/child | | | | | | |
|---|---|---|---|---|---|---|
| | Sphere Guidelines | UNHCR Emergency Indicator | CPT Standards | The Plaza | Senda de Vida II | The Rio Camp |
| 1 person | 45 m²/child | 30 m²/child | 4 m²/child | | | |
| 500 people | 45 m²/child | 30 m²/child | 4 m²/child | 13 m²/child | 23.3 m²/child | 5 m²/child |
| 1,000 people | 45 m²/child | 30 m²/child | 4 m²/child | 6.5 m²/child | 11.65 m²/child | **2.5 m2/child** |
| 1,500 people | 45 m²/child | 30 m²/child | 4 m²/child | 4.3 m²/child | 7.77 m²/child | |
| 2,000 people | 45 m²/child | 30 m²/child | 4 m²/child | 3.25 m²/child | 5.83 m²/child | |
| ,2500 people | 45 m²/child | 30 m²/child | 4 m²/child | 2.6 m²/child | 4.66 m²/child | |
| 3,000 people | 45 m²/child | 30 m²/child | 4 m²/child | **2.17 m2/child** | **3.88 m2/child** | |
| 3,500 people | 45 m²/child | 30 m²/child | 4 m²/child | | 3.33 m²/child | |

*Figure 3: Figure comparing existing settlements' conditions (m2/child) to UNHCR and CPT standards. Elaborated by: Author, 2023. Data from: (CPT, 2015; Sphere, 2018; UNHCR, 2007) and Solidarity Engineering drone data collection*

According to Sphere minimum standards, spatial thresholds would suggest approximately 144 residents at the Plaza, 258 at Senda II, and 55 at Rio under adequate emergency conditions. At peak occupation, however, the Plaza reached approximately 3,000 residents, Senda II reached 3,000 residents, and Rio reached 1,000 residents. Figure 3 extrapolates Figure 2 to compare spatial guidelines for children across frameworks: Sphere's 45 $m^2$ per child, UNHCR's emergency indicator of 30 $m^2$ per child, CPT's standard of 4 $m^2$ per child, and the observed condition of 2.17 $m^2$ per child at the Plaza's peak density.

Under these conditions, spatial allocation is significantly inverted, with multiple children occupying the area defined by single-child standards. Contextualizing these humanitarian benchmarks within the Mexican housing policy framework established by SEDATU and CONAVI underscores the gap between emergency thresholds and formal housing criteria.

Across the three case studies, drone-derived mapping data from 2021 to 2023 illustrates differentiated trajectories of settlement formation, material permanence, camp circulation, and layout configuration. A consistent hatch gradient is used to represent degrees of permanence, ranging from dark grey (existing built environment), to light orange (tarps), darker orange (tents and semi-permanent structures, including sanitation infrastructure), and darkest orange (permanent concrete and steel construction).

The Rio Grande is represented in blue as a fixed geographic boundary condition. The aggregated density, constrained circulation and mixed materiality visualize the disparity amongst migrants in accessing shelter typologies and WASH infrastructure while safely moving throughout the space.

## RESEARCH FINDINGS

Complementing the quantitative analysis, the research also integrates qualitative data from in-depth interviews with migrant women residing in Senda II (a closed, more formalized camp) and Rio (an open, informal camp).

At the shelter level, the Reynosa case study findings highlight how the provision of adequate shelter has a positive impact upon health. Notable findings show that improving energy access and thermal comfort reduces heat

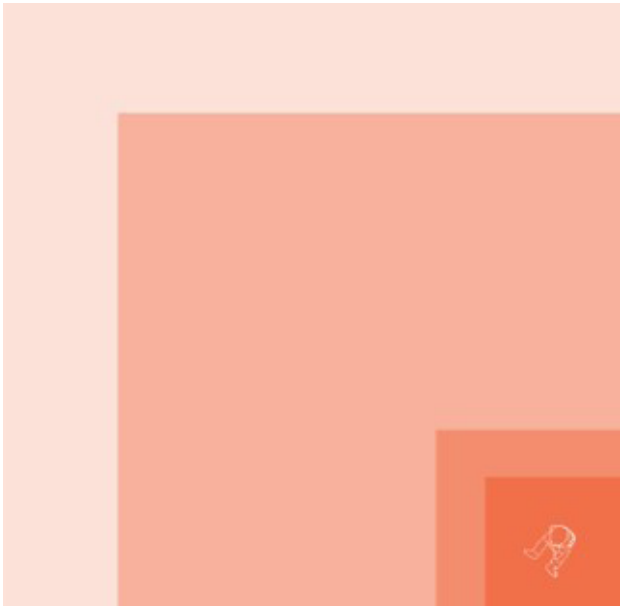


*Figure 4: Illustration depicting UNHCR and CPT standards (m2/child) to Reynosa Plaza de la República peak density of 3000 people. (45 m2 → 30 m2 → 4 m2 → 2.17 m2). Elaborated by: Author, 2023. Data from: (CPT, 2015; Sphere, 2018; UNHCR, 2007) and Solidarity Engineering drone data collection*

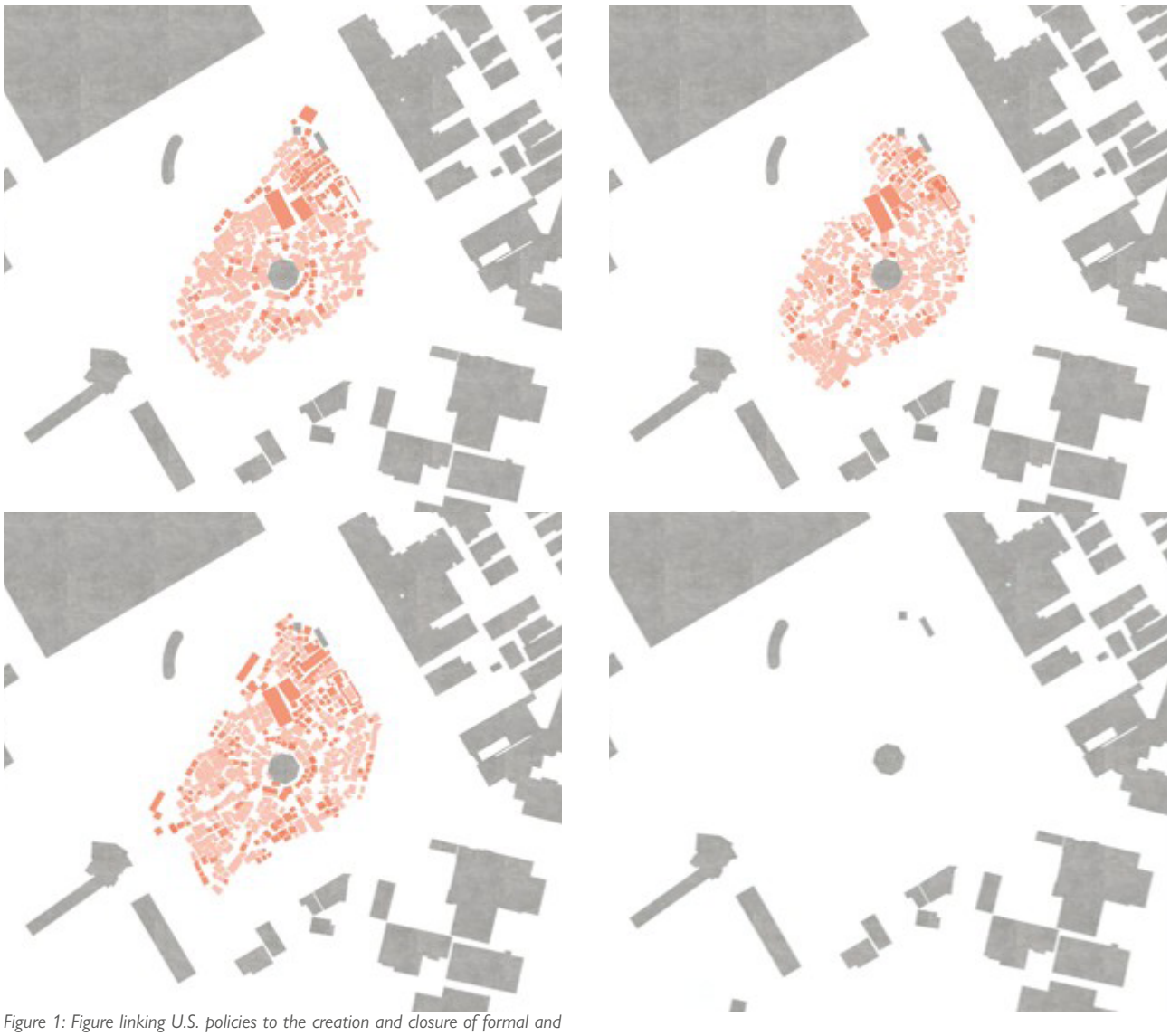


*Figure 1: Figure linking U.S. policies to the creation and closure of formal and informal settlements in Tamaulipas, Mexico. Elaborated by: Author, 2023*

exhaustion; prioritizing ventilation through shelter orientation mitigates respiratory illness; appropriate bedding mitigates skin rashes, and constructed shelters address issues such as poor sanitation, hygiene, psychological stress and insecurity.

Heat exhaustion emerged as a significant health concern, highlighting the need for climate-responsive shelter strategies that improve thermal comfort through passive and active cooling design and access to energy. Every woman interviewed reported experiencing extreme temperatures within their shelters, and one tent-user recounted a near-death experience during a hailstorm, underscoring the vulnerability of inadequate shelter to both chronic heat and acute weather events.

Respiratory illness exposed shortcomings in shelter design. Three distinct shelter typologies were identified at Senda II: casitas (small, permanently constructed shelter), tents, and large covered shelters. All casita users reported experiencing respiratory illness, compared with only 18% of tent occupants, highlighting the importance of adequate ventilation, appropriate shelter orientation, and passive cooling strategies.

These findings also underscore the need to minimize overcrowding and provide well-designed outdoor public spaces that encourage daily activities to occur outside enclosed shelters, thereby improving indoor air quality and reducing the risk of respiratory disease transmission.

Skin rashes emerged as a recurring health issue across the camps, underscoring the importance of appropriate bedding and the equitable distribution of clean non-food items (NFIs), particularly blankets. At Senda II, 100% of women who slept on communal blankets reported skin rashes, as did 100% of those who used bedding previously occupied by another resident. The Reynosa case studies are particularly notable due to the high turnover of diverse populations, where women often shared or transferred NFIs, including tarps, tents, blankets, and mats, within informal, ethnically linked networks, facilitating the circulation of potentially unhygienic materials.

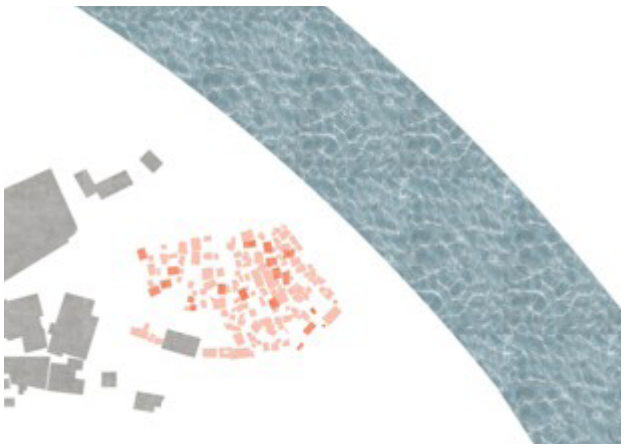
Poor sanitation and hygiene emerged not as the result of individual behaviors but as spatially produced conditions shaped by unequal access to durable shelter, construction materials, and NFI distribution. While none of the women living in casitas reported poor sanitation or hygiene, 72%

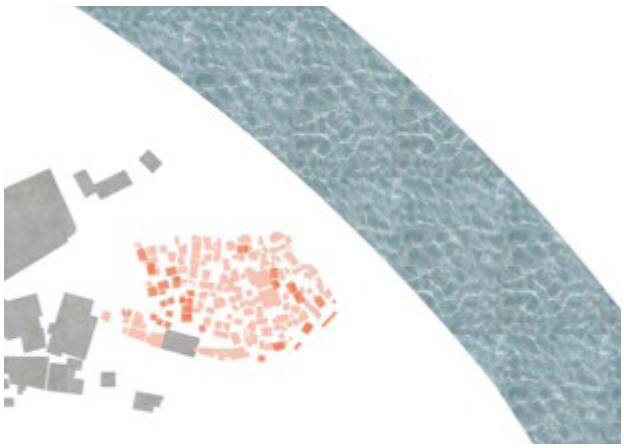
of tent users did, and they were substantially more likely to report exposure to rats and other small animals (90% compared to 20% of casita residents), demonstrating the relationship between shelter typology and environmental health risks. These inequities were further reflected across migrant groups: Haitian migrants were approximately seven times more likely than Latina migrants to report poor sanitation and hygiene. This disparity corresponded with differences in shelter allocation, as Latina migrants more frequently occupied casitas obtained through camp management or previous occupants, whereas Haitian migrants were generally directed to large covered communal areas or tents, most of which they purchased themselves for an average cost of 600 pesos.

Psychological stress, feelings of insecurity, and perceived lack of safety were exacerbated by unequal access to constructed shelters such as casitas, alongside inequitable shelter distribution and insufficient shelter plot sizes. Tent users were 50% more likely to report psychological stress than casita residents, with over 75% of tent users experiencing leaks and structural instability compared to 20% of casita users. All casita residents reported feeling secure and safe, whereas 90% of tent users reported feelings of insecurity and lack of safety, underscoring the relationship between shelter typology and perceived wellbeing. These conditions are further shaped by uneven camp governance and the reliance on out-of-pocket expenditure for shelter access, with 60% of Haitian respondents reporting having paid for shelter materials. In this context, the in this context, there was a strong preference expressed for cash-based interventions (CBI), particularly where distribution systems were inconsistent and residents were required to self-procure essential shelter components, reinforcing existing inequalities in access to safe and stable housing.

At the settlement level, the Reynosa case study findings highlight how the provision of adequate settlements have a positive impact upon health. Notable findings highlight the positive impact of providing adequate play spaces on children's well-being; prioritizing shaded public areas effectively reduces both heat exhaustion and psychological distress; engaging local authorities in project planning can effectively mitigate instances of diarrhea, and improving period infrastructure can mitigate poor sanitation and hygiene.

Heat exhaustion emerged as a significant health concern, highlighting the need for climate-responsive settlement strategies that integrate coordinated project planning, improved WASH infrastructure access, shaded and green space provision, engagement with local authorities and anticipatory settlement growth and expansion strategies.





In Senda II, water scarcity restricts residents to less than 5L per person per day at the familial level, falling below UNHCR emergency indicators and contributing directly to exposure-related heat stress. All women interviewed reported experiencing heat exhaustion and described seeking shaded or ventilated spaces throughout the day for relief. Overall, both Senda II and Rio conditions fall below Sphere Standards and UNHCR emergency indicators, and at times fluctuate below CPT thresholds, reflecting systemic gaps in minimum humanitarian provision.

Respiratory illness exposed shortcomings in settlement design. As an open, informal camp, only 16% of Rio residents reported respiratory illness in comparison to 60% of Senda II residents, suggesting that airflow, circulation patterns and settlement density directly shape health outcomes.These differences highlight the importance of prioritizing circulation, ventilation, open-space integration, and planned settlement growth strategies as core components of humanitarian settlement design.

Diarrhea reports exemplified the health risks associated with insufficient settlement design. Ongoing challenges with the septic system at Senda II, shaped by limited coordination with local authorities and interagency actors, resulted in reliance on porta-potties rather than functional in-settlement WASH infrastructure and compelled women to leave the settlement during the day to wash clothes, access showers, or bathe in the Rio Grande, increasing financial burden and exposing them to unsafe external conditions, including risks associated with gang-controlled areas. These coping strategies effectively displaced sanitation practices into unsafe external environments, with 80% of women who bathed in the river reporting diarrhea. Overall, 60% of Senda II residents and 50% of Rio residents reported diarrhea cases, underscoring the relationship between inadequate WASH systems, off-site sanitation practices, and elevated exposure to waterborne illness, as well as the need for coordinated project planning with trusted partners, strengthened engagement with local authorities, and improved information-sharing among settlement residents.

Poor sanitation and hygiene emerge as a significant settlement-level health concern among women across the sites, particularly in relation to menstrual hygiene management. At Senda II, 90% of women reported inadequate infrastructure to manage menstruation, while at Rio this figure reached 100%. These findings indicate a systematic lack of appropriate WASH facilities and gender-responsive non-food item (NFI) provision within both settlements. In this context, inadequate sanitation infrastructure disproportionately affects women's health and dignity, underscoring the need for more equitable and gender-sensitive WASH planning and distribution strategies in displacement settings.

Psychological stress among migrants underscores the importance of coordinated settlement design that ensures equitable access to basic services, infrastructure, and livelihoods for culturally and linguistically diverse populations. Reported levels of psychological stress are significantly higher in more informal and under-resourced environments, with 100% of Haitian respondents and 100% of Rio residents reporting psychological stress, compared to 60% in Senda II. Psychological stress is further exacerbated by infrastructural dependency, as 100% of women reported reliance on electricity to access the CBP One application. This highlights how digital asylum systems are materially conditioned by uneven access to energy infrastructure, reinforcing the relationship between infrastructure and administrative exclusion.

In terms of healthcare provision, less than 40% of Rio residents reported access to medical care, highlighting substantial deficits in service provision within the most informal settlement context. In contrast, Senda II demonstrates comparatively higher service availability through designated service areas within the settlement and periodic support from international non-governmental organizations (INGOs), indicating a more structured but still uneven service infrastructure.

Differences in play infrastructure further distinguish the settlements. In Senda II, 80% of children reportedly spend most of their time in a designated play space developed together by two implementing partners. Children in this settlement also have access to some structured programming provided by INGOs. In contrast, Rio lacks any dedicated play infrastructure, with residents reporting that there is "nothing" available for children, indicating a complete absence of designed child-friendly space and programming.

## CONCLUSION

This research demonstrates that the provision of adequate shelter and settlements has a positive impact on health. Across the Reynosa case studies, differences in shelter typology, material quality, and distribution, as well as settlement planning, density, spatial organization, infrastructure, and governance consistently shaped health outcomes by influencing exposure to environmental hazards, disease, psychological stress, and access to essential services.

### *FOR PRACTITIONERS:*

Addressing humanitarian shelter and settlements at the urban scale: The Latin American migrant crisis is an urban crisis. Humanitarian shelter and settlements assistance has the opportunity to operate at the urban scale and innovate regional shelter and settlement approaches, prioritizing the creation of safe spaces within the urban fabric. Shelters and settlements along migrant routes act as temporary collective shelters with limited resources and services available. Working with local governments to contextually understand the urban spaces available creates economic opportunities for improved project planning, access to services, access to livelihoods, community building, local infrastructure upgrading, and sustainable accountability of vulnerable populations. Addressing urban conditions at varying scales allows humanitarian shelter and settlements assistance to prioritize safety, equity and stability of migrants, rather than leave populations more exposed to violence, discrimination and uncertainty.

Prioritizing public space and play space: Public space and play space accessibility serve as vital proxy indicators of community health, promoting social connections and addressing the mental and physical health needs of both children and adults. By providing spatial opportunities for rest, recovery and activity, shelter and settlements assistance directly impacts the physical, mental and cognitive development of children, which in turn increases their happiness, well-being and sense of normalcy. Healthier and happier children contribute to the stability, resilience and cohesion of communities.

Increasing funding: Local grassroots initiatives, church groups, and NGOs work diligently to provide migrants with the resources they need. Bringing aid, collecting data and assessing impact require the capacity and resources to develop sustainable systems that address the local context.

Sharing interagency data: Organizations and camp management work in the same spaces together, often repeating work. Developing relationships and systems in violent areas are crucial to delivering equitable aid. Developing systems for agencies to share data allows for cross-analysis of sectors to create accurate needs assessments of settlements.

Developing sustainable collective impact assessments: With dynamic population shifts in various spaces, collaborative impact assessments can alleviate the burden that smaller organizations bear as they complete their quarterly assessments. Traditional assessment methods struggle to capture the full scope of impact with the constant flux of populations. Collaborative impact assessments allow various organization to share resources and data and develop more comprehensive evaluations that more holistically understand community needs.

Advocating for immigration policy reform: U.S. immigration policy is directly related to the development of formal and informal migrant settlements along the border, affecting the health of the thousands who wait and the millions who cross. Policies need to address the vulnerabilities of millions traversing through Latin America, establishing spatially safe opportunities to seek refuge.

### *REFERENCES*


- European Committee for the Prevention of Torture and Inhuman or Degrading Treatment or Punishment (CPT). (2015). Living space per prisoner in prison establishments: CPT standards. Council of Europe.
- Global Design Initiative for Refugee Children (GDIRC) (2023). Designing Play/Social Spaces for Refugee Children and Communities. https://gdirc.org/
- Global Shelter Cluster (GSC). (2018). The State of Humanitarian Shelter and Settlements. Shelter Cluster.
- Jordan, M. (2021, August 25). A Squalid Border Camp Finally Closed. Now Another One Has Opened. New York Times. https://www.nytimes.com/2021/08/25/us/migrant-camp-reynosa-remain-in-mexico.html
- Reidy, E. (2023, May 10). How the US-Mexico border became an unrelenting humanitarian crisis. The New Humanitarian. https://www.thenewhumanitarian.org/news-feature/2023/05/10/how-us-mexico-border-became-unrelenting-humanitarian-crisis
- Secretaría de Desarrollo Agrario, Territorial y Urbano (SEDATU) & Comisión Nacional de Vivienda (CONAVI). (2019). Criterios técnicos para una vivienda adecuada. https://www.gob.mx/conavi/documentos/criterios-tecnicos-para-una-vivienda-adecuada-conavi
- Solidarity Engineering. (2020, November). Our Mission. Humanitarian Response Engineering. https://www.solidarityengineering.org/our-mission
- Sphere. (2018). The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response. Sphere Project.
- United Nations High Commissioner for Refugees (UNHCR). (2007). Handbook for Emergencies (3rd ed.). UNHCR.