Whose Loss? Impact of Cocaine Interdiction on Child Development in Coca-Growing Regions of Colombia

Isabella Caro*

Abstract

Intervention programs targeting early childhood have shown promise in mitigating developmental deficits caused by adverse environments. However, evidence on the unintended negative effects of broader public policies on early childhood development remains scarce. This paper investigates the unintended consequences of a specific security and drug policy, cocaine interdiction, on child development and caregiver well-being in a Colombian region heavily dependent on illegal economic activities. Using data from a randomized staggered impact evaluation design and a difference-in-differences methodology, this study exploits the variation induced by a major coca base seizure between two cohorts to assess its effects on the mental health and developmental outcomes of children and their caregivers. The findings reveal that cocaine seizures reduce caregivers' mental health by 0.15 standard deviations, primarily driven by increased stress and anxiety. Additionally, interdiction negatively impacts children's mental health (-0.43 s.d.) and developmental outcomes (-0.26 s.d.). I argue that these results are conceptually explained through two key mechanisms: (i) income shocks caused by disruptions to coca-dependent local economies, and (ii) increased violence resulting from the restructuring of drug trafficking organizations. Evidence suggests that these ffects are concentrated among households reliant on informal work, highlighting heterogeneous impacts on populations most vulnerable to income shocks. Moreover, the seizure shock significantly increased violent events, providing empirical support for the proposed mechanisms. I interpret these results as evidence of the adverse consequences interdiction policies have on social dynamics; however, further research is needed to better understand the mechanisms through which these outcomes occur.

*Universidad de los Andes, i.caro@uniandes.edu.co

The author declares that they have received no financial support, research funding, or any other form of external assistance related to this study. Additionally, there are no conflicts of interest to disclose.

1 Introduction

Early childhood lays the foundation for life trajectories and long-term outcomes; adverse shocks during this stage impair children's cognitive and socio-emotional development, creating gaps that are difficult, if not impossible, to close in later stages (Attanasio et al., 2022; Currie and Almond, 2011). Despite the recognized importance of early childhood, millions of children are at risk of not reaching their full potential due to factors such as poverty, conflict, and non-stimulating environments, particularly in developing countries (Black et al., 2017). For instance, by 2022, 1 in every 5 children (approximately 400 million) were living in or fleeing conflict-affected areas (UNICEF, 2020). Adverse conditions limit children's potential from the earliest stages of life, fostering inequalities in development and human capital accumulation that drive cycles of intergenerational poverty (Harper et al., 2003).

Given the importance of early years, efforts have focused on safeguarding the well-being of children aged 0 to 5. Policies and programs aimed at promoting socio-emotional skills and creating protective environments have shown restorative effects in countering the adversities that impact early childhood (Baulos et al., 2024). Despite these advancements, a pressing question arises: could certain government policies unintentionally hinder the full development of children living in vulnerable contexts? Government policies have shown to yield unforeseen effects on child development when their broader impacts and embedded incentives are not accounted for (Leventhal and Newman, 2010; Figueiredo and Lima, 2022; Wood, 2018; Rodriguez, 2020).

In the last decade, interdiction policy has become the dominant strategy for controlling the supply of illicit substances, driven by two main reasons. First, the profound social and environmental costs of eradication strategies (Camacho and Mejía, 2017; Mejía, 2016) and the ineffectiveness of crop substitution efforts (Cardiles et al., 2023). Second, this approach stems from the belief that interdiction targets criminal networks involved in drug trafficking while sparing the most vulnerable groups, such as small-scale farmers and ethnic communities. However, it often overlooks the potential of interdiction policies to destabilize regional violence dynamics and disrupt economic flows.

Colombia, producing approximately 67% of the world's cocaine, offers a unique context for studying the impacts of policies implemented in the war on drugs. This context is particularly interesting in areas such as Tumaco, a municipality that holds 25% of the country's coca crops (United Nations Office on Drugs and Crime, 2018) and serves as the port for 60% of Colombia's cocaine exports (Molano, 2017). Due to its strategic location and proximity to maritime routes, Tumaco is a hub for coca production that has historically been affected by violence and internal conflict dynamics. For more than ten years, the UNODC has characterized this municipality as one of the most stable coca production clusters in

the country. Coca-related activities in the municipality include not only cultivation and export but also the transformation and processing of coca leaves into the final product, cocaine alkaloid.

In addition to the coca economy, Tumaco battles with profound socioeconomic challenges, with a multidimensional poverty index that is three times higher than the national average (DANE, 2018). Instead of contributing to solving these structural vulnerability conditions, drug policy has sharpened the social hardships of this region (Marín Llanes, 2020). Historically, the territories where military operations in the war on drugs take place have become centers of violence and forced displacement, exacerbating existing social inequalities in these populations (Youngers and Rosin, 2005) and reinforcing social exclusion (Youngers, 2013).

The unintended consequences of drug policies are well-documented, yet despite the prevalence of interdiction strategies in the current war on drugs, their broader impacts remain poorly understood. This study examines the impact of drug interdiction policies, specifically seizures, on child development and caregiver psychosocial well-being in Tumaco, a vulnerable, coca-dependent region of Colombia. The analysis leverages data from an impact evaluation of a program that aims to protect early childhood development through caregiver mental health. During this period, an exogenous shock in the form of a cocaine-base seizure - equivalent to nearly five times the national 99th percentile - provides a natural experiment to study the effects of drug interdiction policies. Using a difference-in-differences framework, the analysis compares cohorts exposed to the seizure with those unexposed, providing insight into the impact of seizure policies on psychosocial indices.

The theoretical framework of this study proposes a causal link between interdiction policies and child development through income shocks and increases in violence, with caregivers' mental health playing acting as a central mechanism. In regions where the economy heavily depends on illicit activities, interdiction efforts disrupt income for individuals and businesses directly or indirectly connected to these markets. This dynamic is evident in certain regions of Colombia, such as Tumaco, where the coca economy constitutes the primary productive sector and has been shown to drive the region's economic activity (Marín-Llanes et al., 2024). Consequently, the loss of coca or cocaine shipments reduces local liquidity, reducing domestic demand and, in turn, the income of local businesses and residents. Furthermore, seizures are argued to escalate violence, as criminal groups are incentivized to consolidate control over alternative routes and territories to ensure the flow of shipments beyond the reach of authorities (Viscardi and Tenembaum, 2023). As will be further developed in the paper, these joint variations in income and violence levels adversely affect caregivers' mental health, leading to psychological hardships and ultimately hindering children's developmental outcomes.

The empirical findings of this paper confirm these theoretical predictions. My results suggest a consistent pattern of adverse effects on both caregivers and children. Among caregivers surveyed following the event, mental health declined by 0.15 standard deviations, primarily driven by increased anxiety levels. These negative outcomes among caregivers are reflected in children, who experienced a 0.43 s.d reduction in their mental health index and a 0.26 s.d decline in developmental outcomes. Children's mental health and development indices show a consistent decline across all dimensions, underscoring the potential adverse impacts of stress stemming from interdiction policies.

To examine the mechanisms driving these effects, the analysis explores differential impacts based on caregiver employment type, distinguishing between formal and informal jobs. The findings reveal that caregivers in informal employment experience greater negative outcomes, mainly due to the close connection between informal labor, income, and local demand. A decline in local demand reduces both the income and job opportunities available to informal workers. This economic strain, in turn, has been associated with increased caregiver stress, which contributes to more punitive parenting practices and adverse impacts on child development (Neppl et al., 2016). In addition to economic impacts, the results show a 10 percentage point increase in the likelihood that caregivers experience direct violence in the cohorts surveyed after the seizure. Seizures disrupt the equilibrium of violence between criminal groups, intensifying territorial disputes and resulting in higher levels of violence and heightened perceptions of insecurity within the civilian population.

One of the main limitations of this study is the specificity of the contexts to which its results are applicable. The findings are particularly relevant to settings where economies are heavily reliant on illicit activities, such as the coca economy, and where socioeconomic vulnerability and poverty are pervasive. Nevertheless, these results hold true for drug-producing countries experiencing expansion, as well as for regions implementing repressive and punitive drug policy measures, especially within the Latin American context.

A second limitation of the study is one assumption of the identification strategy. The study assumes that, over the six-month span between follow-up measurements for the control and treatment groups, no additional events—other than the studied seizure—occurred that might have influenced the observed outcomes. In 2018, following the 2016 Peace Treat with the Revolutionary Armed Forces of Colombia, armed groups and dissidents form the FARC moved to fill the power vacuum, seeking control over strategic territories previously held by the group. While this period was characterized by violence and conflict, the data shows no significant changes in violence or insecurity levels during the six-month study

period, nor structural changes in the configuration of armed actors in this municipality. On the contrary, violence and insecurity levels were on a downward trend until the coca base seizure occurred.

The contribution of this paper is twofold. First, this study contributes to the academic literature by highlighting the indirect effects of state interventions, particularly drug interdiction policies, on early childhood development. While existing research has explored the effects of policies such as migration and deportation (Wood, 2018; Bandiera et al., 2023), housing relocation (Leventhal and Newman, 2010), and overall legal frameworks (Figueiredo and Lima, 2022; Flynn et al., 2023) on child well-being, the consequences of security and drug policies remain largely unexplored. By focusing on cocaine seizures and their unintended negative effects on both children and civilian populations, this study addresses a gap in understanding how these interventions can shape early developmental outcomes, offering a new perspective on the broader social implications of state security measures.

Secondly, this study contributes to the literature on the effects of strategies employed in the war on drugs by being the first, to the best of my knowledge, to examine the impact of coca seizures on child well-being and development in coca-producing regions, extending the focus beyond rural farming communities. While existing research has consistently highlighted the effects of drug policy interventions on violence, socioeconomic hardship, environmental degradation, and human capital accumulation, much of this work has concentrated on eradication and supply-side interventions (Viscardi and Tenembaum, 2023; Rozo, 2014; Sviatschi, 2022; Mejia and Restrepo, 2016). The socioeconomic consequences of interdiction policies, particularly those targeting high-value layers of illicit markets such as cocaine and coca base, remain largely unexamined. This paper seeks to fill this gap by providing causal evidence on how interdiction efforts not only disrupt illicit markets but also hinder social and child development, offering a more far-reaching understanding of the impacts of seizure policies.

2 Conceptual Framework

This section outlines the conceptual framework linking state interventions to control cocaine supply with the psychosocial well-being of caregivers and children aged 0 to 5. First, it reviews key factors identified in the literature as determinants of early childhood development. This foundation helps contextualize the vulnerabilities children face in regions affected by illicit economies. Next, this section discusses the role of illicit economies and the outcomes of past strategies in the war on drugs, providing insights into the unintended consequences that have historically accompanied these interventions. Finally, the third subsection presents the theoretical argument that guides this study, identifying two primary mechanisms,

violence and income loss, through which the interdiction of illegal markets may affect the mental health and development outcomes of caregivers and children in regions driven by illicit economies. This framework sets the stage for understanding the broader, indirect impacts of interdiction policies on vulnerable populations.

2.1 Early Childhood

Child development is shaped by various social, economic, and demographic factors. This article focuses on two determinants of early childhood development: exposure to violence and income shocks. Both forms of adversity contribute to *toxic stress*, a prolonged activation of the stress response system driven by factors such as economic instability or violence. This condition has been shown to negatively impact brain development, emotional growth, and both physical and mental health in children (Shonkoff et al., 2012). Early exposure to chronic stress disrupts neural connections, particularly in brain regions responsible for emotional regulation and cognitive functions. The developmental disparities that emerge during this period often persist, reinforcing cycles of inter generational poverty and long-term vulnerability.

The *Parenting Stress Model* (Masarik and Conger, 2017) suggests that economic shocks, such as income loss, adversely affect caregivers' psychological well-being. Financial strain increases the risk of anxiety and depression in parents, hindering their ability to provide a stable and nurturing environment. This strain often translates into less sensitive and, at times, more punitive parenting practices. Ultimately, stress from economic uncertainty reduces the positive interactions and affectionate care that parents can offer their children. Research by Shah et al. (2012) demonstrates that scarcity fundamentally alters how individuals allocate their attention, leading them to focus intensely on immediate challenges while overlooking others. Together, these findings illustrate how economic hardship and its psychological consequences disrupt caregivers' ability to prioritize and sustain supportive caregiving practices.

Similarly, exposure to violent contexts—common in areas affected by illicit markets—heightens the perceived risk within the community, intensifying household stress and diminishing caregivers' capacity to create a safe and emotionally stable setting for their children. Prolonged exposure to high levels of stress disrupts neurological processes involved in emotional regulation and socialization. This condition impairs children's ability to form trusting, empathetic relationships, skills essential for long-term emotional and social well-being (Nijssens et al., 2020).

The literature highlights that both income shocks and exposure to violence disrupt early childhood development by exacerbating caregivers' mental health challenges and creating stressful environments for

children. These adverse conditions undermine children's mental health and developmental trajectories, reinforcing cycles of vulnerability. Now, I turn to examine how interventions targeting illicit economies can influence income and violence dynamics.

2.2 A major economy: the Colombian coca sector

> "Coca is like a roundabout: it starts here and keeps turning. Right now, I have the money, tomorrow he has it, then the butcher has it, the grocer has it, the supermarket has it, the people selling cellphones have it... the coca economy itself creates jobs here. And not just here in Llorente, this is nationwide."
>
> — *Llorente, Nariño, testimony to the Truth Commission, 2019*

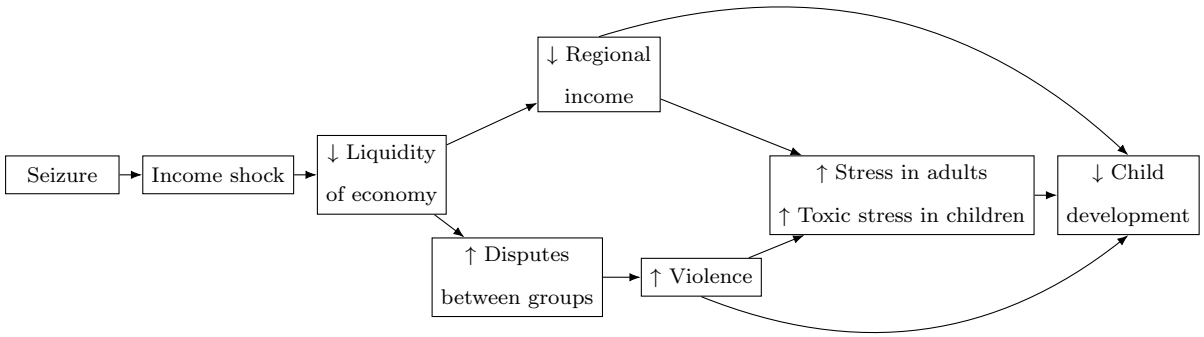
Despite traditional views positioning illicit economies as barriers to development and state-building, these economies have contributed to economic and social growth, as well as state expansion. (Andreas, 2013; Britto, 2020; Thomson et al., 2024). In Colombia, for instance, cocaine production in 2018 represented nearly 2% of the national GDP—almost double that of the coffee sector (Montenegro et al., 2019). A recent study finds that in municipalities where the coca boom occurred following the announcement of the National Crop Substitution Program (PNIS), municipal GDP increased between 2.8% and 10.5% (Marín-Llanes et al., 2024). Similarly, a recent report from the United Nations Office on Drugs and Crime (2022) notes unusual growth in populated areas near coca crops, evidenced by the appearance of previously uncommon businesses such as flower shops, brand-name clothing stores, and electronics shops, as well as the construction of buildings taller than two stories.

Even if there are regions governed by gangs or criminal groups, particularly those linked to illicit economies (Blattman et al., 2021), the literature has also examined how these markets can create opportunities and provide economic benefits for communities residing in these areas. Testimonies from Llorente, presented to the Truth Commission in 2019, highlight how coca serves as a key economic driver in coca-growing areas, supporting various activities and providing income to a wide segment of the population. Duncan (2014) emphasizes that the dominance of illegal capital over legal capital reshapes the local economy, with businesses and livelihoods that depend directly or indirectly on illicit capital becoming increasingly tied to the coca economy. Integration of the coca economy into the socioeconomic fabric of these regions complicates interdiction policies and raises the risk of unintended consequences for the civilian population (Ciro, 2024). Consequently, interdiction policies that aim to disrupt illicit activities also inadvertently affect civilian populations dependent on these economic flows.

Research has extensively documented the harmful effects of supply-side interventions on individuals. Regarding economic hardship, Dammert (2008) emphasizes that efforts to reduce coca production often lead to shocks in household income, which, in turn, increase children's participation in work outside the home. On the issue of violence, Abadie et al. (2015) argue that prohibitionist strategies have fueled guerrilla-led violence, as illegal groups fight to retain control over critical resources for their operations. Similarly, Viscardi and Tenembaum (2023) associate interdiction policies with organizational shifts among criminal groups, as they compete for alternative routes and territories, intensifying violent clashes between rivals. Finally, these strategies have been linked to heightened poverty, increased school dropouts, worsened social challenges (Rozo, 2014), as well as increased health risks for civilians living in affected areas (Camacho and Mejía, 2017).

To better understand the implications of cocaine base seizures, it is important to outline the production process from coca leaf to the final product, as this process determines the value of the seized material. Cocaine production begins with the harvesting of coca leaves, sold in Colombia at an average price of $0.60 USD per kilogram. These leaves are then crushed and mixed with chemicals to create coca paste, valued at around $480 USD per kilogram—an increase of over 80,000% from the raw leaves. The paste is further processed and purified into cocaine base, raising its price by about 30% to $640 USD per kilogram. Finally, the cocaine base is crystallized into cocaine hydrochloride, the form ready for international trafficking, reaching a value of approximately $1,150 USD per kilogram, an 80% increase from coca base. These prices, sourced from the United Nations Office on Drugs and Crime (2022), reflect Colombian domestic values, which rise substantially when the product reaches global markets. Reyes (2014) argues that price of cocaine in producing countries like Colombia represents only 1% to 2% of its final value in consumer markets, highlighting the far-reaching implications of a seizure on the complex cocaine production and trafficking network.

2.3 Theoretical argument



Building on, violence and income loss significantly impact both mental health and early childhood development. At the same time, interventions aimed at controlling the supply of illicit substances can disrupt the balance in violence and income flows in regions deeply tied to illicit markets, such as coca-producing areas (Mejia and Restrepo, 2016). By threatening or eliminating a primary income source, these policies destabilize local economies, creating liquidity shocks that affect community purchasing power, weaken aggregate demand, and ultimately reduce overall income in the region (Duncan, 2014). This sequence of economic shocks, as illustrated in the diagram above, exacerbates stress among caregivers, affecting their mental health, and diminishing their ability to provide nurturing and secure bonds of attachment for children, a protective shield for child development in adverse environments (Lieberman and Van Horn, 2011).

The dual pressures of income loss and increased violence undermine early childhood development through both direct and indirect pathways. The economic and security-related stress experienced by caregivers weakens their ability to provide stable and nurturing relationships crucial for building emotional and psychological resilience in young children. Furthermore, increased violence intensifies caregivers' fears for safety, often limiting children's opportunities for outdoor play and social interaction (Tolbert, 2012). Simultaneously, reduced household income jeopardizes access to nutritious food, further hindering physical and cognitive growth. These interconnected challenges, restricted social engagement, and poor nutrition pose risks to the overall development of children aged 0-5.

3 Backgroud: Tumaco

Tumaco, a municipality in the department of Nariño located in southwestern Colombia, shares borders with Ecuador to the south and the Pacific Ocean to the west. Its geostrategic location, coupled with favorable conditions for coca cultivation, has positioned Tumaco as a central hub for illicit economies and smuggling. In 2018, the United Nations Office on Drugs and Crime (UNODC) reported that Nariño accounted for 25% of Colombia's coca cultivation, maintaining this high concentration consistently over the past decade. Tumaco serves not only as a major production area for cocaine but also as a major export point, with approximately 60% of the cocaine exported from Colombia departing from its port (Molano, 2017).

The municipality's vulnerability is exacerbated by a combination of limited state presence, challenging geographic conditions, and pervasive violence. Tumaco has been a focal point of territorial disputes among armed groups vying for control, resulting in persistent armed conflict and high levels of violence. In 2018, Tumaco's homicide rate reached 75.86 per 100,000 inhabitants—almost three times the national

average of 25.37 per 100,000 inhabitants (Ministry of Justice, 2018). The high levels of violence reflect the interconnected dynamics between rural and urban areas in Tumaco, where rural coca cultivation supports urban centers that concentrate the more lucrative stages of cocaine processing and exportation, intensifying conflict in the municipal capital (Fundación Ideas para la Paz, 2018).

Tumaco's structural challenges extend beyond violence. The municipality suffers from deficient infrastructure, limited access to potable water, and prolonged state neglect, all of which contribute to acute levels of poverty. In 2018, Tumaco's Multidimensional Poverty Index (MPI) was 53.7%, three times higher than the national average (DANE, 2018). Additionally, unmet basic needs affect 48.7% of the urban population and 48.6% of the rural population (Fundación Paz y Reconciliación, 2017). These socio-economic vulnerabilities, compounded by systemic neglect and ongoing conflict, underscore Tumaco's vulnerable position.

3.1 Seizures

In 2018, the Colombian government's intervention policies focused on four main strategies aimed at combating drug trafficking: the seizure of coca base and cocaine hydrochloride, as well as the destruction of infrastructure dedicated to the production of coca and cocaine. According to the United Nations Office on Drugs and Crime (UNODC), approximately 26% of the potential pure cocaine hydrochloride production, equivalent to 293 tons, were seized during 2018.

Nariño has emerged as a strategic hub for cocaine production and distribution networks in Colombia, recording the highest volume of drug seizures and dismantled laboratories in the country as of 2018. According to the United Nations Office on Drugs and Crime (2018), the department accounts for 38% of all drug seizures nationwide—equivalent to 8.6 tons of coca base and 110 tons of cocaine—and 93 cocaine production laboratories dismantled. These efforts are part of broader strategies aimed at reducing drug supply and undermining the ability of illegal armed groups to finance their activities through illicit economies.

3.2 Violence and armed configuration

The 2016 Peace Agreement, signed in Havana and ratified between the Colombian government and the FARC-EP, marked a historic step toward ending over five decades of armed conflict—the longest in the country's history. However, the agreement also gave rise to dissident factions of the FARC, composed of members who rejected its terms and continued to operate illegally. The demobilization of the FARC created a power vacuum in many regions where the group had previously monopolized territorial control.

Following their withdrawal, other armed groups[1], sought to seize these strategic territories (Fundación Ideas para la Paz, 2018). This transition sparked an escalation of violence as these groups clashed over resources and territorial dominance, intensifying the armed conflict in areas previously under FARC control.

In Tumaco, during the first semester of 2018, several armed groups moved to fill the power vacuum left by the FARC's demobilization. Among the key actors were the Oliver Sinisterra Front (OSF), led by alias "Guacho", a dissident faction of the FARC involved in controlling drug trafficking routes, and the group known as United Guerrillas of the Pacific (GUP), identified as a criminal organization with a strong focus on narcotics and extortion. The rivalry between these groups, along with the intensification of criminal activities such as extortion and drug trafficking, escalated violence in the municipality. This surge in violence also had severe humanitarian repercussions, including forced displacement and threats to the civilian population (Fundación Ideas para la Paz, 2018).

By the second semester of 2018, Tumaco experienced an unprecedented decline in violence, with only two homicides reported in rural areas and none in the urban center (National Police, 2018). While media outlets largely attributed this reduction to the death of alias "Guacho", the leader of the Oliver Sinisterra Front, an investigative report by the independent media outlet *Cerosetenta* offers a different perspective (Arias, 2018). Drawing on interviews with local residents and community leaders, the report argues that the decrease in violence stemmed from a previous truce between the Oliver Sinisterra Front and the United Guerrillas of the Pacific. This agreement was reportedly motivated by economic considerations, as escalating violence had drawn heightened state intervention, disrupting the armed groups' drug trafficking operations. Kyle Johnson, senior analyst at the International Crisis Group, stated, "The violence became highly visible, generating too much attention, which ultimately harms the business" (Arias, 2018).

The data trends presented in Figure 4 demonstrate a consistent decline in Tumaco's levels of homicides and personal injuries beginning in April 2018, providing empirical support for the assertion that a truce between criminal groups was established prior to December of that year. While this reduction in violence is notable, the *Cerosetenta* report (Arias, 2018) underscores the inherently fragile nature of such agreements. The peace equilibrium between these groups was described as unstable, with even minor provocations risking the collapse of the agreement.Incidents such as coca seizures, can escalate tensions, leading to accusations of collusion with state forces or acts of betrayal. This fragility is further reflected in Figure 4, where an uptick in violence is observed following the seizure under analysis, suggesting a potential link between the event and the increase in homicides.

[1]Including the National Liberation Army (ELN), the Autodefensas Gaitanistas de Colombia (AGC), and FARC dissidents

Furthermore, the economic and territorial power of non-state armed groups cannot be compared to the dominance once held by the FARC. Following the peace process, these groups became highly fragmented, along with their economic and territorial influence. As illustrated in Figure A1, the departure of the FARC led to the emergence of numerous smaller non-state armed groups, each with limited market power over the coca economy and the associated illicit networks.

3.3 Data and Methodology

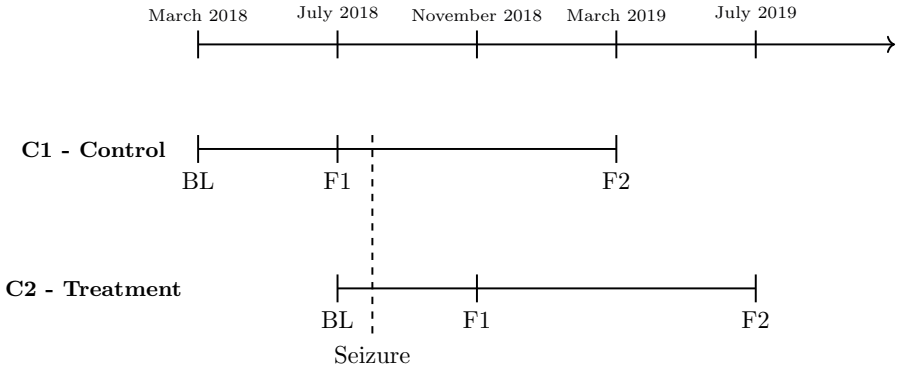
Estimating the causal impact of drug policies is inherently challenging due to the lack of random assignment of interventions and the non-random nature of exposure to such strategies. This study addresses these challenges using data from an impact evaluation that features a staggered experimental design. In this design, participants were randomly assigned to one of four cohorts, allowing analysis of results over different time periods. The study also exploits an exogenous shock, an unprecedented increase in coca base seizures, that occurred during the data collection phase which coincided with the staggered implementation of the experimental design. This alignment allows for a comparison between cohorts exposed to the shock and those that were not. This methodological framework integrates the internal validity of a randomized controlled trial (RCT) with a variation introduced by the exogenous shock to the cocaine market.

The study draws on data from the Semillas de Apego program's impact evaluation (Moya et al., 2024), a community-based intervention targeting primary caregivers of children aged 0 to 5 in communities affected by violence and forced displacement. The program aims to enhance caregiver mental health and strengthen emotional bonds with children, creating a buffer against the adverse effects of violence and vulnerability (Moya, 2018). Data were collected at three time points—March, July, and November—in both 2018 and 2019, as illustrated in Figure 1. The study employed a staggered experimental design, assigning participants to one of four cohorts to facilitate the evaluation of program impacts over time. The data collection focused on caregivers and children residing in Tumaco's main municipal area.

To evaluate the program's impact, data were collected across five key dimensions: caregiver mental health, child-caregiver interactions, the quality of the child-caregiver relationship, child mental health, and early childhood development. Each of these areas was assessed using validated psychometric scales, which are detailed in the Appendix A1.1, along with their psychometric properties and reliability. The caregiver mental health scale evaluated symptoms of anxiety, depression, and hostility. The child-caregiver relationship quality scale focused on the strength of the relationship, examining subareas such as conflict, closeness, and the child's dependence on the caregiver. The interaction scale measured the fre-

quency of positive and negative interactions, as well as shared routines between caregivers and children. The child mental health scale assessed dimensions such as anger, anxiety, and depression in children. Lastly, the early childhood development scale identified socioemotional and behavioral challenges

Figure 1: Data collection

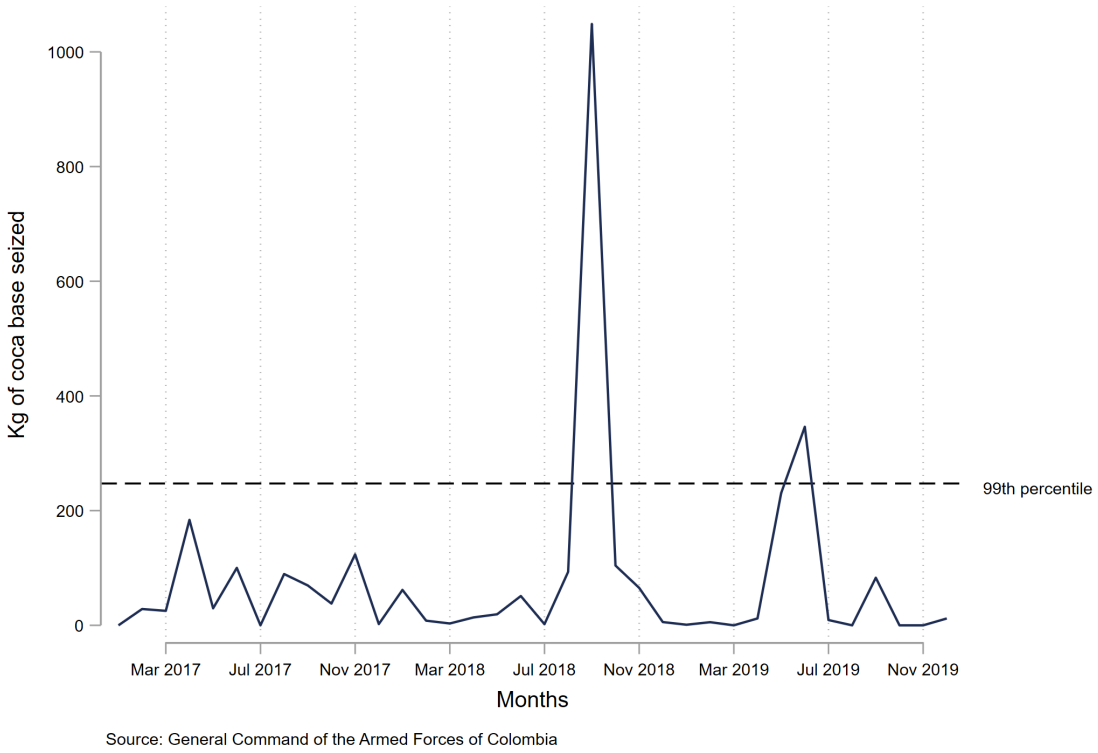


Note: C represents the cohort, BL signifies the baseline, and F1 and F2 refer to follow-up lines 1 and 2, respectively.

During the data collection period, the authorities reported a 1.1 tons cocaine base seizure, almost five times the 99th percentile of the size of cocaine base seizures in the country of 250 k.g (see Figure 2). The data on seizures was provided by the General Command of the Armed Forces of Colombia, which compiles daily georeferenced data disaggregated by the type of substance seized, from coca leaf to cocaine. This event offers a unique opportunity to analyze the impact of drug interdiction on psychosocial outcomes, since the seizure occurred in September 2018, three months before the first wave of data collection for the second cohort. This timing allows for a design where both cohorts have baseline data collected before the seizure, but only cohort 2 was exposed to the event. As a result, cohort 1 serves as the control group, while cohort 2 serves as the treatment group.

The impact evaluation data was collected in four different cohorts, each observing caregivers and their respective children at three points in time: baseline, first follow-up, and second follow-up. However, for my main econometric model, I will only use the baseline and first follow-up data from cohorts 1 and 2 (see Figure 1), as these groups exhibit variation in treatment exposure. The second follow-up is not included in the main specification because a ceasefire was declared in Tumaco in December 2018, which could introduce a confounding factor. However, I still include this wave in the analysis to estimate a lower bound of the impact of the seizures. Previous research using the same data shows that the ceasefire led to improvements in psychosocial well-being (Sánchez-Ariza et al., 2023). Therefore, if the impact is negative in these additional analyses, it would suggest that the negative impact of the seizures outweighs the positive effects of the ceasefire. In addition, cohorts 3 and 4 will be included in a later purely descriptive exercise to compare participant characteristics before (cohorts 1 and 2) and after (cohorts 3 and 4) the seizure.

Figure 2: National levels of coca base seizure



Source: General Command of the Armed Forces of Colombia

Table 1 show balance in baseline characteristics for caregivers and children in cohorts 1 and 2. The average age of children in the sample is 2.8 years, while caregivers have a mean age of 29 years. Among caregivers, 94% are female, and 85% are the mothers of the participating children. The average household size is five members. At baseline, 81% of households reported being victims of direct violence, and 61% had experienced internal displacement.

Table 1: Baseline: Descriptives and Balance

	(1) Total	(2) Control Cohort 1	(3) Treatment Cohort 2	(4) Diff (2)-(3)
Panel A. Child				
Child Age (months)	34.53	33.56	35.45	-1.89***
	(6.570)	(5.456)	(7.356)	[0.539]
Female (=1)	0.53	0.52	0.54	-0.02
	(0.500)	(0.501)	(0.499)	[0.042]
Child birth order	1.91	1.90	1.93	-0.02
	(1.191)	(1.158)	(1.222)	[0.099]
Panel B. Caregiver				
Age (years)	29.07	29.44	28.72	0.72
	(9.301)	(9.191)	(9.404)	[0.777]
Female (=1)	0.94	0.94	0.94	-0.01
	(0.240)	(0.247)	(0.233)	[0.020]
Caregiver is the mother (=1)	0.85	0.83	0.87	-0.04
	(0.357)	(0.379)	(0.335)	[0.030]
Years of education	11.86	12.06	11.67	0.40
	(3.896)	(3.938)	(3.853)	[0.326]
Panel C. Household				
Household size	5.00	5.05	4.96	0.09
	(2.055)	(2.089)	(2.026)	[0.172]
Number of children under 5yrs	1.32	1.34	1.30	0.04
	(0.574)	(0.584)	(0.565)	[0.048]
Two-parent hh (=1)	0.70	0.69	0.70	-0.01
	(0.460)	(0.462)	(0.459)	[0.039]
Asset index	-1.67	-1.62	-1.71	0.10
	(1.230)	(1.240)	(1.220)	[0.103]
CCT recipient (=1)	0.48	0.52	0.45	0.08
	(0.500)	(0.500)	(0.498)	[0.042]
Head has formal job (=1)	0.20	0.22	0.18	0.04
	(0.401)	(0.415)	(0.387)	[0.034]
Panel D. Violence				
Victim of direct violence (=1)	0.81	0.83	0.79	0.04
	(0.393)	(0.376)	(0.408)	[0.033]
Number of violent events	2.41	2.39	2.42	-0.03
	(1.870)	(1.814)	(1.924)	[0.156]
IDP (=1)	0.61	0.61	0.60	0.01
	(0.488)	(0.488)	(0.490)	[0.041]
Panel E. Indices				
Caregiver Mental Health	-0.08	-0.11	-0.05	-0.06
	(1.015)	(1.022)	(1.009)	[0.085]
Relationship Quality	0.04	0.10	-0.02	0.11
	(1.083)	(1.167)	(0.997)	[0.091]
Interactions	0.04	0.17	-0.07	0.24**
	(0.983)	(0.978)	(0.976)	[0.082]
Child Mental Health	-0.01	-0.11	0.09	-0.20*
	(0.989)	(1.098)	(0.865)	[0.083]
Early Childhood Development	-0.09	-0.10	-0.08	-0.02
	(1.064)	(1.031)	(1.095)	[0.089]
Observations	573	277	296	573
Joint F-statistic	5.906			

Notes: Column 1 presents descriptive statistics for the full sample. Columns 2 and 3 display the control and treatment groups, respectively, while Column 4 shows the difference in means between these two groups. Standard deviations are in parentheses, and standard errors are in brackets. * ρ <0.1. ** ρ <0.05. *** ρ <0.01.

This framework provides the basis for a difference-in-differences (DiD) model, formally expressed as follows:

$$Y_{i,c,t} = \gamma_0 + \gamma_1 Post_t * Treatment_{i,c} + \phi_i + \phi_t + \epsilon_{i,c,t,d} \quad (1)$$

The dependent variable $Y_{i,c,t}$ represents child development, child mental health, caregiver mental health, and caregiver-child interactions for individual (i), belonging to cohort (c), at the time (t). The variable $Treatment_{i,c}$ indicates treatment assignment, equaling 1 if the individual belongs to cohort 2 and 0 otherwise, since only cohort 2 was exposed to the seizure. The temporality is captured by the variable $Post_t$, which takes the value of 1 for the first follow-up wave. Individual-level fixed effects (ϕ_i) control for unobserved, time-invariant characteristics, such as baseline socio-economic conditions or genetic predispositions, isolating within-individual variation and reducing bias from omitted variables. Time-period fixed effects (ϕ_t) capture common shocks or trends affecting all individuals, while standard errors ($\epsilon_{i,c,t}$) are clustered at the child development center level and account for correlations within individuals, time periods, and cohorts.

The parameter γ_1 captures the causal effect of the coca base seizure on the outcomes of interest. For this parameter to be interpreted causally, the primary identification assumption is that no other significant events, aside from the seizure, occurred during the six-month interval between the first follow-up of cohort 1 and cohort 2 that could affect the psychosocial indicators under study. As noted above, levels of violence, measured by homicide rates and personal injuries, were on a declining trend many months prior to the coca base seizure. This suggests that changes in psychosocial indicators during this period are unlikely to be confounded by fluctuations in violence levels, or other type of conflict. Additionally, the parallel trends assumption is supported by the observed balance between cohorts (see Table 1) prior to the intervention, ensuring that, in the absence of the seizure, both groups would have followed similar trajectories in the outcomes. Furthermore, spillover effects and anticipatory behaviors are unlikely, as the temporal nature of the shock is exploited, with its occurrence preceding the data collection for the treatment group.

4 Results

Table 2 summarizes the impacts of a coca base seizure on caregiver mental health, the quality of child-caregiver relationships and interactions, child mental health, and child development. If the theoretical framework outlined above holds, one would expect to observe declines across all five main areas due to the economic shock and heightened levels of violence caused by the seizures. The results align with this

expectation, indicating sizeable and statistically significant declines in outcomes for both caregivers and children exposed to the seizure. All outcomes were standardized such that higher scores correspond to better outcomes. For instance, a higher coefficient in the anxiety dimension represents lower anxiety levels, signifying an improvement in mental health. These findings suggest that, under the assumptions for causal inference discussed previously, exposure to seizures directly and adversely impacts psychosocial and developmental outcomes for both caregivers and children.

Table 2: Coca Seizure Impact on Main Dimensions

	(1)	(2)
Panel A. Caregiver Mental Health		
	-0.152*	-0.152*
	[0.078]	[0.087]
Observations	1104	1104
Panel B. Relationship Quality		
	-0.003	-0.003
	[0.104]	[0.137]
Observations	1104	1104
Panel C. Interactions		
	-0.089	-0.089
	[0.089]	[0.096]
Observations	1104	1104
Panel D. Child Mental Health		
	-0.433***	-0.433***
	[0.093]	[0.104]
Observations	1104	1104
Panel E. Early Childhood Development		
	-0.261***	-0.261**
	[0.086]	[0.094]
Observations	1104	1104
Individual fixed effects	Yes	Yes
Wave fixed effects	Yes	Yes
Cluster CDI	No	Yes

Notes: Column 1 presents estimates with individual and wave fixed effects. Column 2 includes standard errors clustered at the level of early childhood development centers. Standard errors are reported in brackets. Statistical significance levels are indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Caregiver mental health experienced a measurable decline of 0.19 s.d, reflecting heightened stress and psychological strain in the aftermath of the coca base seizure. The consequences for children were even more pronounced, with child mental health decreasing by 0.43 s.d and child development showing a decline of 0.26 s.d..Although the quality of caregiver-child relationships and interactions also deteriorated, these changes were not statistically significant when compared to cohort 1. The negative effects of the seizure are notable not only for their magnitude but also for their severity, being comparable to, and in some instances twice as large as, the positive impacts achieved through the program's impact evaluation (Moya et al., 2024).

An in-depth analysis of caregiver mental health highlights significant increases in general anxiety and phobic anxiety, with levels rising by 0.24 and 0.15 standard deviations (sd), respectively. These findings point to the psychological impact of disruptions associated with interdiction efforts, such as economic instability and heightened exposure to violence. Economic shocks, compounded by increased insecurity, create conditions that amplify stress and erode mental well-being, particularly among caregivers who already face high baseline levels of vulnerability. Theoretical frameworks on chronic and acute stress (Pearlin et al., 1981) emphasize that such stressors, whether sudden or sustained, can accumulate to exacerbate mental health symptoms.

Table 3: Impact on Caregiver Mental Health

	(1)	(2)
Global Scale	-0.152*	-0.152*
	[0.078]	[0.087]
Anxiety	-0.241***	-0.241**
	[0.078]	[0.104]
Depression	-0.066	-0.066
	[0.077]	[0.072]
Phobic Anxiety	-0.151*	-0.151
	[0.081]	[0.093]
Hostility	-0.118	-0.118
	[0.081]	[0.108]
Sensitivity	-0.097	-0.097
	[0.081]	[0.075]
Observations	1104	1104
Individual Fixed Effect	Yes	Yes
Wave Fixed Effect	Yes	Yes
Clustered errors	No	Yes

Notes: Column 1 presents estimates with individual and wave fixed effects. Column 2 includes standard errors clustered at the level of early childhood development centers. Standard errors are reported in brackets. Statistical significance levels are indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

When analyzing the quality of relationships and interactions (see Table 4 & Table 5) between caregivers and children, there are opposing trends. Although the overall results point to a general worsening in outcomes, two specific dimensions show clear improvements: difficult parent-child interactions become less frequent, and the use of negative discipline declines. These positive changes, while not enough to significantly increase the overall index scores, remain statistically significant. One possible explanation lies in the concept of *compensatory parenting* (Grogan-Kaylor et al., 2019), a strategy where caregivers intentionally create positive experiences and avoid negative ones to help counterbalance the harsh realities their children face. This often translates into a conscious reduction in negative discipline, as parents

strive to shield their children from further stress or harm, reflecting a protective response to challenging circumstances.

Table 4: Impact on Relationship Quality

	(1)	(2)
Global Scale	-0.027	-0.027
	[0.073]	[0.097]
Difficult Child	0.161	0.161
	[0.100]	[0.163]
Parent-Child difficult inter.	0.172*	0.172
	[0.103]	[0.099]
Parental distress	-0.061	-0.061
	[0.108]	[0.092]
Observations	1104	1104
Individual Fixed Effect	Yes	Yes
Wave Fixed Effect	Yes	Yes
Clustered errors	No	Yes

Notes: Column 1 presents estimates with individual and wave fixed effects. Column 2 includes standard errors clustered at the level of early childhood development centers. Standard errors are reported in brackets. Statistical significance levels are indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Impact on Interactions

	(1)	(2)
Global Scale	-0.089	-0.089
	[0.089]	[0.096]
Positive discipline	0.596***	0.596***
	[0.101]	[0.103]
Negative discipline	-0.451***	-0.451***
	[0.102]	[0.113]
Routines	0.052	0.052
	[0.098]	[0.115]
Observations	1090	1090
Individual Fixed Effect	Yes	Yes
Wave Fixed Effect	Yes	Yes
Clustered errors	No	Yes

Notes: Column 1 presents estimates with individual and wave fixed effects. Column 2 includes standard errors clustered at the level of early childhood development centers. Standard errors are reported in brackets. Statistical significance levels are indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Upon exploring child mental health dimensions (see Table 6), findings reveal a consistent and statistically significant decline across all seven dimensions that make up the child mental health index. Notably, anxiety increases (0.27 s.d), dissociation rises (0.34 s.d), and post-traumatic stress rises as well (0.43 s.d). For child development (see Table 7), results reveal a decline in socio-emotional competence (0.17 s.d) and an increase in behavioral problems (0.16 s.d). These results shed light on the sensitivity of children

during this phase of significant brain malleability. (Shah et al., 2012).

Table 6: Impact on Child Mental Health

	(1)	(2)
Global Scale	-0.433***	-0.433***
	[0.093]	[0.104]
Anxiety	-0.297***	-0.297***
	[0.095]	[0.101]
Depression	-0.343***	-0.343**
	[0.097]	[0.134]
Dissociation	-0.343***	-0.343***
	[0.095]	[0.107]
Anger	-0.246***	-0.246***
	[0.069]	[0.070]
Sex Concern	-0.436***	-0.436***
	[0.119]	[0.120]
Post Traumatic Stress	-0.433***	-0.433***
	[0.095]	[0.132]
Observations	1104	1104
Individual Fixed Effect	Yes	Yes
Wave Fixed Effect	Yes	Yes
Clustered errors	No	Yes

Notes: Column 1 presents estimates with individual and wave fixed effects. Column 2 includes standard errors clustered at the level of early childhood development centers. Standard errors are reported in brackets. Statistical significance levels are indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

An alternative explanation for these results is that caregivers and children may not be objectively worse off compared to the previous cohort; rather, the acute stressors in their environment may have influenced their perceptions, leading to reports of lower psychosocial well-being. This phenomenon is akin to findings in educational research, where students perform worse on tests during hot days, not necessarily due to a lack of knowledge, but because heat-induced stress impairs cognitive function (Gavel, 2021). Similarly, acute stressors in caregivers' environments can affect their perceptions and self-reports, potentially leading to lower reported levels of psychosocial well-being, as all scales are reported by the caregiver. However, acute and prolonged stress in early childhood can have lasting detrimental effects on development, disrupting emotional regulation, cognitive functioning, and socio-emotional growth.

Table 7: Impact on Child Development

	(1)	(2)
Global Scale	-0.261***	-0.261**
	[0.086]	[0.094]
Socio-emotional competence	-0.173*	-0.173
	[0.104]	[0.129]
Behavioral Problems	-0.158*	-0.158*
	[0.081]	[0.085]
Observations	1102	1102
Individual Fixed Effect	Yes	Yes
Wave Fixed Effect	Yes	Yes
Clustered errors	No	Yes

Notes: Column 1 presents estimates with individual and wave fixed effects. Column 2 includes standard errors clustered at the level of early childhood development centers. Standard errors are reported in brackets. Statistical significance levels are indicated as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5 Mechanisms

The following two sections aim to provide evidence on how the two channels proposed in the theoretical framework—income shocks and increases in violence—are indeed at play and contribute to explaining the observed results, particularly the reductions in outcomes for both caregivers and children. While these exercises are purely descriptive and do not establish causal relationships, they provide valuable insights into the mechanisms.

5.1 Income

This section presents results that provide descriptive evidence of the income mechanism described in the conceptual framework, focusing on two key objectives. First, it assesses whether the coca base seizure led to an income contraction in the region, using shifts in the proportion of individuals in informal employment as an indicator. An increase in informal employment would signal the economic strain induced by the contraction, consistent with established patterns in labor market responses to economic shocks. Second, it explores whether income shocks, along with the associated stress, are a mechanism underlying the observed deterioration in psychosocial outcomes. If this hypothesis holds, individuals in informal employment—characterized by heightened vulnerability to income instability and lack of protective mechanisms—are expected to exhibit more pronounced negative effects compared to those in formal employment.

The academic literature has extensively documented how economic contractions not only increase labor informality (Meagher, 2013) but also worsen the conditions for those already working in the informal sector (Mackett, 2020). During periods of economic contraction, micro and small enterprises are particularly hard-hit, leading to a decline in formal employment and a corresponding rise in informal la-

bor. Studies highlight that this phenomenon disproportionately impacts women, as research by Carranza et al. (2020) reveals that women are particularly vulnerable to economic shocks, experiencing greater income losses and job instability when compared to men. In the context of the study, wherein 94% of the sample consists of women, it is plausible to hypothesize that a contraction in the economy resulting from the coca base seizure could lead to a decline in formal employment within the sample.

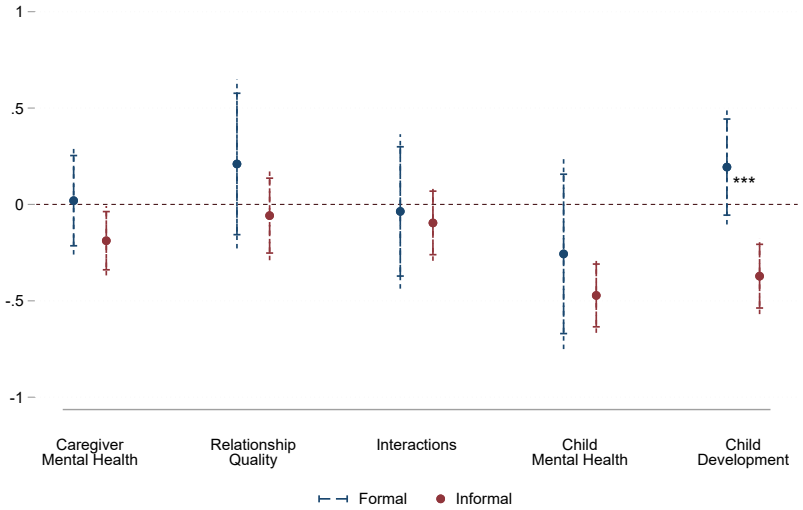
Table 8: Percentage of Caregivers with Formal Employment at Baseline

	(1) Cohort 1 & 2	(2) Cohort 3 & 4	(3) Diff (2)-(3)
Formal worker (=1)	0.17	0.10	0.07***
	(0.377)	(0.303)	[0.019]
Observations	573	803	1376

Notes: Column 1 reports the average formal employment for Cohorts 1 and 2. Column 2 reports the average formal employment for Cohorts 3 and 4. Column 3 reports the differences between the averages in Columns 1 and 2, with standard deviations presented in parentheses and standard errors shown in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Evidence from Tumaco and the economic contraction caused by the coca base seizure supports both hypotheses regarding the impacts of economic shocks. Table 8 compares the percentage of participants with formal employment at baseline in Cohorts 1 and 2, prior to the seizure, with the levels of formal employment in Cohorts 3 and 4. The analysis reveals a statistically significant 7% decrease in the likelihood of formal employment following the seizure.

Figure 3: Heterogeneous Effects by Formal and Informal Job at Baseline



Notes: Graphical summary of the heterogeneous effects on the five main dimension. 90% and 95% confidence intervals are reported. Stars indicate statistically significant differences between coefficients.

When examining the heterogeneous effects[2] by employment status at baseline: caregivers in informal jobs consistently experience more severe negative impacts across all five main areas (see Figure 3). This analysis is particularly relevant because, without the seizure, there would be no reason to expect

[2]The estimates were obtained by stratifying the data according to whether caregivers were engaged in formal or informal work at baseline and calculating Equation 1 separately for each subgroup.

different results between formal and informal caregivers in the follow-up waves for cohorts 1 and 2. The fact that children of informally employed caregivers show worse outcomes suggests that economic strain could be mediating the main findings. That said, the analysis faces some limitations, as only 20% of the sample represents formally employed individuals (98 caregivers). This limited sample size reduces statistical power, making it more challenging to estimate precise differences between the two groups. Nevertheless, the results for child development remain robust, showing statistically significant worse outcomes for children whose caregivers are in informal employment. These findings suggest that a potential mechanism underlying the decline in caregiver and child outcomes could be an economic contraction induced by the coca base seizure.

5.2 Violence

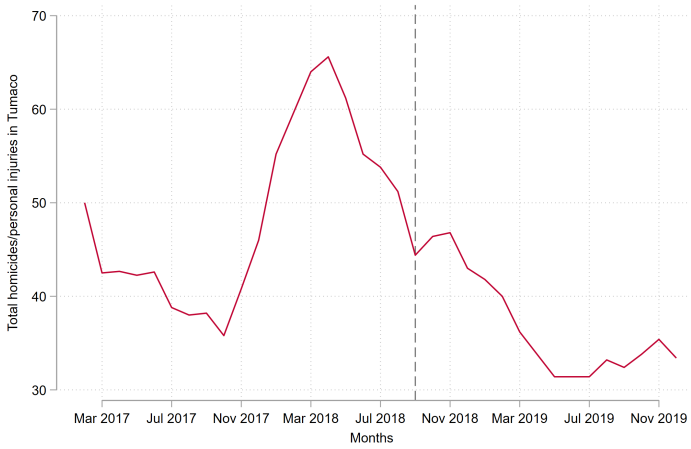
Academic research has examined the impact of drug law enforcement, including interdiction, on violence levels. Werb et al. (2011), in a systematic review of the literature, found that 93% of studies on this topic reported an increase in violence associated with intensified drug law enforcement. Similarly, Reuter (2017) highlights that poorly coordinated interdiction strategies can fragment drug markets, intensifying violent conflicts among rival groups. The findings from this study following the coca-base seizure are consistent with previous evidence. Table 9 presents the estimates of Equation 1, where the dependent variable is replaced with the probability of being a direct victim of violence, self-reported by caregivers. The results indicate that caregivers in cohort 2 (post-seizure) were 10 percentage points more likely to report being direct victims of violence compared to those in cohort 1 (pre-seizure). Additionally, Tumaco experienced increases in homicides, personal injuries, and thefts (see Figure 4 & Figure 5) after the seizure, contrary to the previous trend of declining levels of violence.

Table 9: Impact on the Probability of Being a Victim of Direct Violence in the Last Three Months

	(1)
Victim of direct violence in the last three months (=1)	0.108*
	[0.056]
Constant	0.686***
Observations	1106

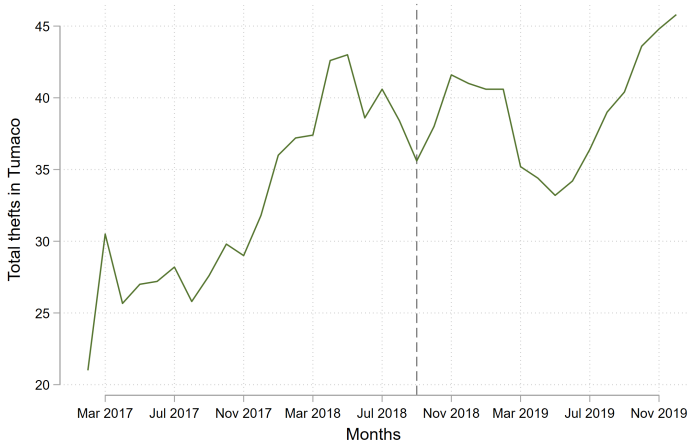
Notes: Estimate of Equation 1 when regressed on violence variable. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 4: Monthly homicides and Personal injuries in Tumaco



Note: Data sourced from the National Police of Colombia

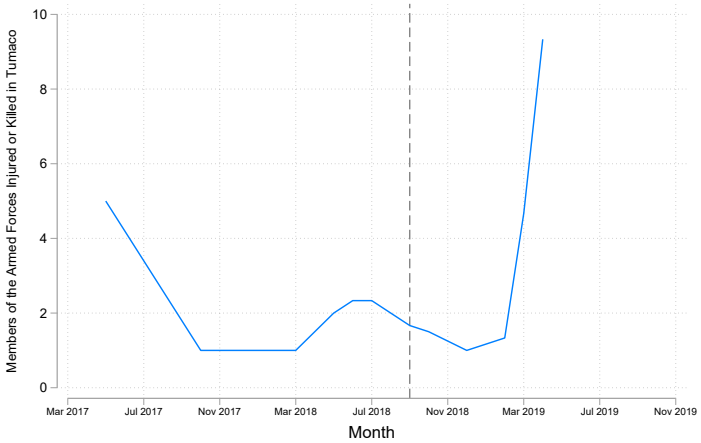
Figure 5: Monthly thefts in Tumaco



Note: Data sourced from the National Police of Colombia

On the other hand, it could be argued that the spike in homicide and personal injury levels was not due to confrontations with public security forces. As illustrated in Figure 6, there is no observable increase in casualties or injuries among security force members; in fact, a subtle decline is observed. This evidence could suggest that the increase in homicides was driven more by violent confrontations between armed groups than by direct clashes with law enforcement.

Figure 6: Monthly Members of the Armed Forces Injured or Killed in Tumaco



Note: Data sourced from the National Police of Colombia

6 Conclusions and Policy Implications

This paper seeks to contribute to the scarce literature on how and what types of public interventions influence child development, while opening an agenda focused on drugs and security policies that, although initially aimed at targeting criminal organizations, have harmful consequences for civilians—particularly for the most vulnerable groups, such as children. This study investigates the unintended and overlooked impacts of drug interdiction policies, specifically cocaine seizures, on vulnerable populations in coca-producing regions. While these strategies are often justified as targeting the most powerful actors in the drug trade without affecting vulnerable populations, the findings suggest otherwise. Seizures are associated with significant declines in caregiver mental health and child development outcomes. By documenting these effects, this study fills a gap in the literature, highlighting the broader social consequences of interdiction policies that extend beyond drug production metrics to directly impact the well-being of individuals and communities dependent on illegal economies.

Leveraging a natural experiment and micro-level data within a specific context, this study provides evidence of the social costs of interdiction efforts. While I present suggestive evidence indicating that this shock to drug markets affects child development through local income disruptions and increased violent events, further research should focus on deepening our understanding of the proposed mechanisms. Qualitative fieldwork could provide valuable insights into how cocaine seizures generate income shocks, escalate violence, and heighten insecurity, further refining our understanding of the indirect effects of interdiction policies. Moreover, empirical designs capable of testing the theoretical and empirical hypotheses developed in this paper at a national scale are necessary to transcend context-specific findings and progress toward more generalizable conclusions.

These findings carry significant policy implications. First, regarding child development policies, this paper highlights the importance of adopting a general equilibrium approach in policy evaluations. While certain outcomes defined as primary objectives of a public policy or program may show gains, the potential costs in other dimensions should also be assessed. Admittedly, constructing a fully holistic approach is often unfeasible for practitioners and scholars. However, unintended consequences for children—especially those under five years old—should be prioritized in policy analyses as critical outcomes. If practitioners continue implementing interventions that undermine the full development of early childhood, including their mental health, the broader goals of fostering human capital accumulation, enhancing well-being, and closing inequality gaps will remain a daunting challenge.

Second, just as aerial fumigation was discontinued after evidence highlighted its harmful effects, the unintended consequences of interdiction strategies necessitate a reassessment of their social harms. The "War on Drugs" has placed a disproportionate burden on countries in the Global South, exacerbating social, economic, and political challenges. Despite decades of aggressive enforcement, the broader impacts of these policies remain insufficiently understood. This underscores the need for a comprehensive evaluation of current drug policies and for the exploration of more equitable and sustainable approaches to address the complexities of illicit economies. As with prior drug control policies such as aerial spraying and alternative development, this study demonstrates the severe consequences these strategies have on social dynamics, including the well-being of children under five years old. If further research confirms the inefficiency of interdiction policies, along with previous interventions, the growing evidence from this body of literature points to regulating drug markets as the only approach yet to be tried.

References

Abadie, A., Acevedo, M. C., Kugler, M., and Vargas, J. (2015). Inside the war on drugs: Effectiveness and unintended consequences of a large illicit crops eradication program in colombia. Technical report.

Andreas, P. (2013). *Smuggler Nation: How Illicit Trade Made America*. Oxford University Press, New York, NY.

Arias, N. (2018). La inquietante tregua de diciembre en tumaco. Publicado en Cerosetenta.

Attanasio, O., Cattan, S., and Meghir, C. (2022). Early childhood development, human capital, and poverty. *Annual Review of Economics*, 14:853–892.

Bandiera, A., Dinarte Diaz, L., Rozo, S. V., Schmidt-Padilla, C., Sviatschi, M. M., and Winkler, H. (2023). The unintended consequences of deportations: Evidence from firm behavior in el salvador. *Economic Development and Cultural Change*, 71(4):1331–1358.

Baulos, A. W., García, J. L., and Heckman, J. J. (2024). Perry preschool at 50: What lessons should be drawn and which criticisms ignored? Working Paper 32972, National Bureau of Economic Research.

Bernal, R., Martínez, M. A., and Quintero Salleg, C. (2015). Situación de niñas y niños colombianos menores de cinco años, entre 2010 y 2013. Technical report, Universidad de los Andes - CEDE, Bogotá, Colombia.

Black, M. M., Walker, S. P., Fernald, L. C., Andersen, C. T., DiGirolamo, A. M., Lu, C., McCoy, D. C., Fink, G., Shawar, Y. R., Shiffman, J., et al. (2017). Advancing early childhood development: From science to scale 1: Early childhood development coming of age: Science through the life course. *Lancet (London, England)*, 389(10064):77.

Blattman, C., Lessing, B., Tobon, S., and Duncan, G. (2021). Gang rule: Understanding and countering criminal governance. OSF Preprints.

Britto, L. (2020). *Marijuana Boom: The Rise and Fall of Colombia's First Drug Paradise*. University of California Press, Berkeley, CA.

Camacho, A. and Mejía, D. (2017). The health consequences of aerial spraying illicit crops: The case of colombia. *Journal of Health Economics*, 54:147–160.

Cardiles, A., Castillo, G., Celis, N., Guerra, J. A., López-Uribe, M. d. P., Marín Llanes, L., Ospina, M. A., Ramos, B., Rubiano, M. J., Vélez, M. A., and Zuleta, H. (2023). Resumen de la evaluación institucional, de resultados y de impacto del programa nacional integral de restitución de tierras. Technical report, Departamento Nacional de Planeación, CESED, Universidad de los Andes. Informe elaborado por Ipsos-Uniandes para el DNP (DNP-986-2022).

Carranza, E., Farole, T., Gentilini, U., and Packard, T. G. (2020). Women and economic shocks: Income losses and job instability. *World Bank Report*. World Bank Publication.

Ciro, E. (2024). *Levantados de la selva: Vidas y legitimidades en los territorios cocaleros del Caquetá*. Universidad de los Andes, Facultad de Ciencias Sociales, Bogotá, Colombia.

Currie, J. and Almond, D. (2011). Human capital development before age five. In *Handbook of labor economics*, volume 4, pages 1315–1486. Elsevier.

Dammert, A. C. (2008). Child labor and schooling response to changes in coca production in rural peru. *Journal of Development Economics*, 86(1):164–180.

DANE (2018). Medida de pobreza multidimensional municipal de fuente censal 2018. Technical report, Departamento Administrativo Nacional de Estadística (DANE), Bogotá, Colombia.

Duncan, G. (2014). *Beyond Plata o Plomo: The Political Economy of Drug Trafficking in Colombia*. Oxford University Press, New York.

Figueiredo, E. and Lima, L. R. (2022). Unintended consequences of trade integration on child labor. *Journal of Economic Behavior & Organization*, 194(C):523–541.

Flynn, R. M., Shaman, N. J., and Redleaf, D. L. (2023). The unintended consequences of "lack of supervision" child neglect laws: How developmental science can inform policies about childhood independence and child protection. *Social Policy Report*, 36(1):1–38.

Fundación Paz y Reconciliación (2017). Análisis de necesidades básicas insatisfechas en colombia. Technical report, Fundación Paz y Reconciliación, Bogotá, Colombia.

Gavel, D. (2021). When heat hits, student learning suffers. https://www.hks.harvard.edu/announcements/when-heat-student-learning-suffers. Accessed: January 10, 2025.

Grogan-Kaylor, A. C., Stein, S., Galano, M., and Graham-Bermann, S. A. (2019). Contributions to parenting under stress for women who have experienced intimate partner violence. *Partner Abuse*, 10(2):164–179.

Harper, C., Marcus, R., and Moore, K. (2003). Enduring poverty and the conditions of childhood: Lifecourse and intergenerational poverty transmissions. *World Development*, 31(3):535–554. Chronic Poverty and Development Policy.

Kling, J. R., Liebman, J. B., and Katz, L. F. (2007). Experimental analysis of neighborhood effects. *Econometrica*, 75(1):83–119.

Leventhal, T. and Newman, S. (2010). Housing and child development. *Children and Youth Services Review*, 32(9):1165–1174.

Lieberman, A. F. and Van Horn, P. (2011). *Psychotherapy with infants and young children: Repairing the effects of stress and trauma on early attachment.* Guilford Press.

Mackett, O. (2020). The effects of covid-19 on women in south africa: an analysis using the social provisioning framework. *Social and Health Sciences*, 18(2). Published online.

Marín Llanes, L. (2020). El asesinato de líderes sociales: Efecto no intencionado de la sustitución de cultivos de uso ilícito. Master's thesis, Universidad de los Andes.

Marín-Llanes, L., Fernández, M., Vélez, M. A., Martínez-González, E., and Murillo-Sandoval, P. (2024). Coca-based local growth and its socio-economic impact in colombia. Technical Report 31, Centro de Estudios sobre Desarrollo Económico (CEDE) y CESED, Universidad de los Andes, Bogotá, Colombia.

Masarik, A. S. and Conger, R. D. (2017). Stress and child development: a review of the family stress model. *Current Opinion in Psychology*, 13:85–90.

Meagher, K. (2013). Unlocking the informal economy: A literature review on linkages between formal and informal economies in developing countries. Technical report, WIEGO Working Paper No. 27.

Mejia, D. and Restrepo, P. (2016). The economics of the war on illegal drug production and trafficking. *Journal of Economic Behavior & Organization*, 126(PA):255–275.

Mejía, D. (2016). Plan colombia: An analysis of effectiveness and costs. Technical report, Foreign Policy at Brookings. Improving Global Drug Policy: Comparative Perspectives and UNGASS 2016.

Molano, A. (2017). *De río en río. Vistazo a los territorios negros.* Penguin Random House, Bogotá, Colombia.

Moya, A. (2018). Experimental evaluation of semillas de apego. *Clinical Trials*, pages 1–10.

Moya, A., Torres, M. J., Sánchez-Ariza, J., Harker, A., Lieberman, A., Niño, B., and Reyes, V. (2024). Caregiver mental health and early childhood development in conflict-affected settings: Experimental evidence from colombia. Technical report, CEDE Working Paper.

Neppl, T. K., Senia, J. M., and Donnellan, M. B. (2016). Effects of economic hardship: Testing the family stress model over time. *Journal of Family Psychology*, 30(1):12–21.

Nijssens, L., Vliegen, N., and Luyten, P. (2020). The mediating role of parental reflective functioning in child social–emotional development. *Journal of Child and Family Studies*, 29:2342–2354.

Pearlin, L. I., Menaghan, E. G., Lieberman, M. A., and Mullan, J. T. (1981). The stress process. *Journal of Health and Social Behavior*, 22(4):337–356.

Reuter, P. (2017). Interdicting international drug trafficking: a network approach for evaluating strategies. *European Journal on Criminal Policy and Research*, 26(1):1–20.

Reyes, A. (2014). The economic impact of cocaine production in colombia. *Journal of Illicit Economies and Development*, 6.

Rodriguez, C. (2020). The effects of aerial spraying of coca crops on child labor, school attendance, and educational lag in colombia, 2008-2012. *Journal on Education in Emergencies*, 6(1).

Rozo, S. V. (2014). On the unintended consequences of enforcement on illegal drug producing countries. Technical Report PWP-CCPR-2014-005, California Center for Population Research (CCPR), Los Angeles, CA. CCPR Population Working Papers, University of California, Los Angeles.

Sánchez-Ariza, J., Cuartas, J., and Moya, A. (2023). The mental health of caregivers and young children in conflict-affected settings. In *AEA Papers and Proceedings*, volume 113, pages 336–41.

Shah, A. K., Mullainathan, S., and Shafir, E. (2012). Some consequences of having too little. *Science*, 338(6107):682–685.

Shonkoff, J. P., Garner, A. S., Siegel, B. S., Dobbins, M. I., Earls, M. F., McGuinn, L., Pascoe, J., Wood, D. L., on Psychosocial Aspects of Child, C., Health, F., on Early Childhood Adoption, C., Care, D., and et al. (2012). The lifelong effects of early childhood adversity and toxic stress. *Pediatrics*, 129(1):e232–e246.

Sviatschi, M. M. (2022). Making a narco: Childhood exposure to illegal labor markets and criminal life paths. *Econometrica*, 90(4):1701–1741.

Thomson, F., Meehan, P., and Goodhand, J. (2024). The political economy of illicit drug crops: forum introduction. *Journal of Peasant Studies*.

UNICEF (2020). 25 years of children in armed conflict: Fact sheet. Accessed: 2024-11-26.

United Nations Office on Drugs and Crime (2018). Monitoreo de territorios afectados por cultivos ilícitos 2018. Technical report, United Nations Office on Drugs and Crime (UNODC), Bogotá, Colombia.

United Nations Office on Drugs and Crime (2022). Informe de monitoreo de territorios con presencia de cultivos de coca 2022. Technical report, United Nations Office on Drugs and Crime (UNODC), Bogotá, Colombia.

Viscardi, N. and Tenembaum, G. (2023). Violencias, territorios y tráfico de drogas en américa latina. *Revista de Ciencias Sociales*, 35(53):1–25.

Werb, D., Rowell, G., Guyatt, G., Kerr, T., Montaner, J., and Wood, E. (2011). Effect of drug law enforcement on drug-related violence: Evidence from a scientific review. Technical report, International Centre for Science in Drug Policy (ICSDP). ICSDP Report.

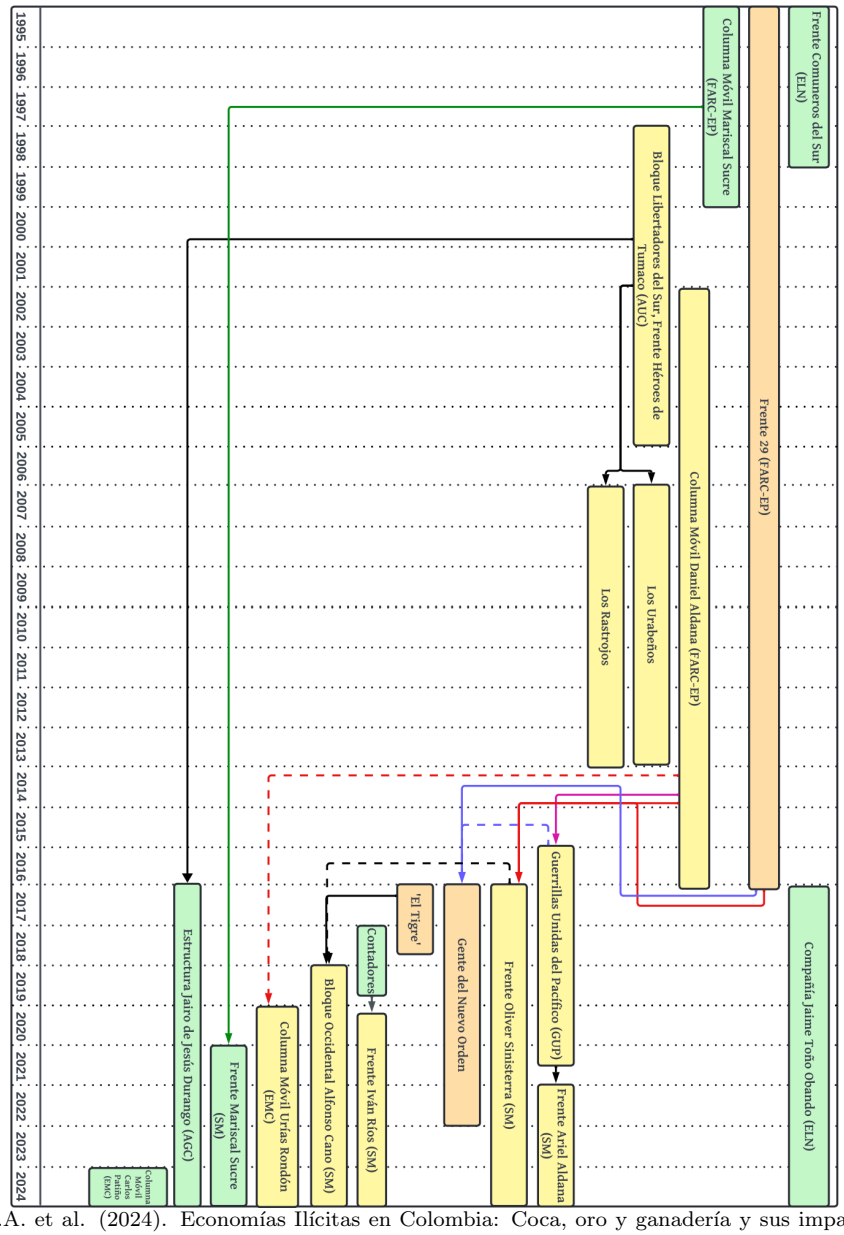
Wood, L. C. N. (2018). Impact of punitive immigration policies, parent-child separation and child detention on the mental health and development of children. *BMJ Paediatrics Open*, 2(1):e000338.

Youngers, C. A. (2013). El debate sobre políticas de drogas en américa latina. *Urvio, Revista Latinoamericana de Seguridad Ciudadana*, No. 13:13–29.

Youngers, C. A. and Rosin, E., editors (2005). *Drugs and Democracy in Latin America: The Impact of U.S. Policy*. Lynne Rienner Publishers, Boulder, CO.

1 Appendix

Figure A1: Territorial Presence of Non-State Armed Groups in Tumaco (1995-2024)



Source: Vélez, M.A. et al. (2024). Economías Ilícitas en Colombia: Coca, oro y ganadería y sus impactos ambientales - Reporte GITOC.

A1.1 Scales and Indices

1. *Caregiver mental health* was assessed using an adapted version of the Symptoms Checklist-90-Revised (SCL-90-R) scale, which measures nine dimensions of psychological distress (Derogatis & Unger, 2010). At baseline, the scale demonstrated strong internal consistency, with a Cronbach's alpha of $\alpha_{BL} = 0.95$.

2. *Child-caregiver relationship quality* was measured with the Parenting Stress Index - Short Form

(PSI-SF), which evaluates overall stress in the parenting relationship and includes subconstructs such as parental distress, parent-child dysfunctional interactions, and perceptions of a difficult child. At follow-up, the index incorporated both the PSI-SF and the Child-Parent Relationship Scale (CPR), which measures the quality of the child-caregiver relationship through subconstructs of relational conflict, closeness, and child dependence. Both scales demonstrated strong internal consistency, with $\alpha_{BL} = 0.88$ for the PSI-SF and $\alpha_{BL} = 0.70$ for the CPR scale.

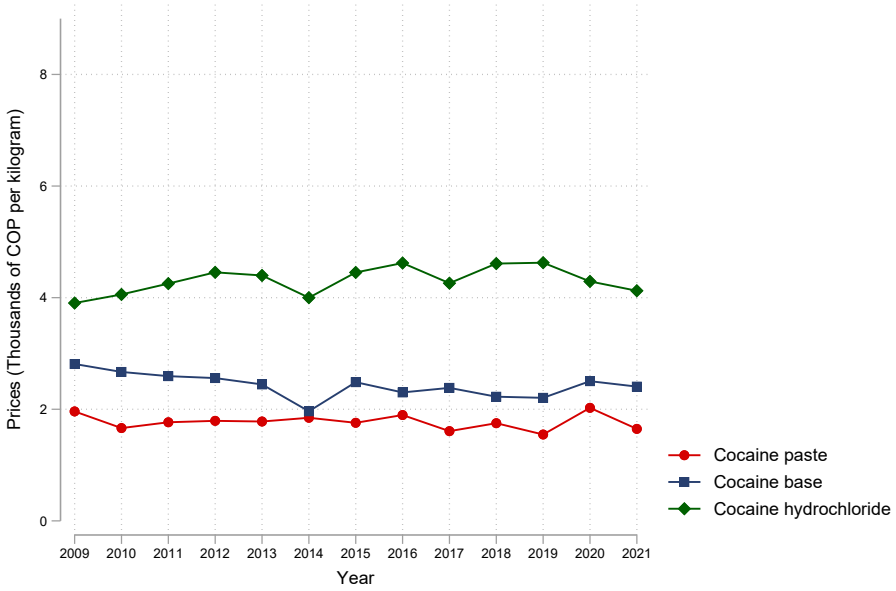
3. *Child-caregiver interactions* index was constructed using a survey instrument adapted from the Colombian Longitudinal Survey (Bernal et al., 2015) to measure the type and frequency of caregivers' interactions with their children. It assessed various activities, such as reading, watching TV, playing in a park, and the use of positive and negative discipline practices. The scale's Cronbach's alpha at baseline was relatively low ($\alpha_{BL} = 0.46$), indicating limited internal consistency and suggesting that the items may not be closely related.

4. *Child mental health* index was constructed using the Trauma Symptom Checklist for Young Children (TSCYC), a validated instrument designed to measure a range of psychopathologies and mental health dimensions, including anger, anxiety, depression, post-traumatic stress, and dissociation. Consistent with standard practice, the data were caregiver-reported. The TSCYC exhibited very good reliability, with a Cronbach's alpha of 0.91.

5. *Early childhood development* was assessed using the Brief Toddler Socioemotional Assessment (BITSEA), a caregiver-reported instrument designed to evaluate social-emotional development in children. The scale captures both social-emotional and behavioral problems or delays, as well as deficits in social-emotional competence. The BITSEA demonstrated good reliability, with a Cronbach's alpha of 0.76, indicating strong internal consistency.

* The indices are constructed by aggregating items from a single sclae or various scales and assessments within each dimension, using a weighted average approach based on the standardized inverse covariance of the items, as proposed by Kling et al. (2007). This method minimizes measurement error from individual scales and simplifies the analysis by consolidating multiple dimensions into composite indices. The indices are standardized using baseline values, and child development scales are further adjusted to account for the child's age, ensuring comparability across groups and time points.

Figure A2: Prices of coca paste, base, and cocaine hydrochloride in the Pacific Region of Colombia



Note: United Nations Office on Drugs and Crime (UNODC), 2023

Figure A3: Child Mental Health Heterogeneous Effects by Formal and Informal Job at Baseline

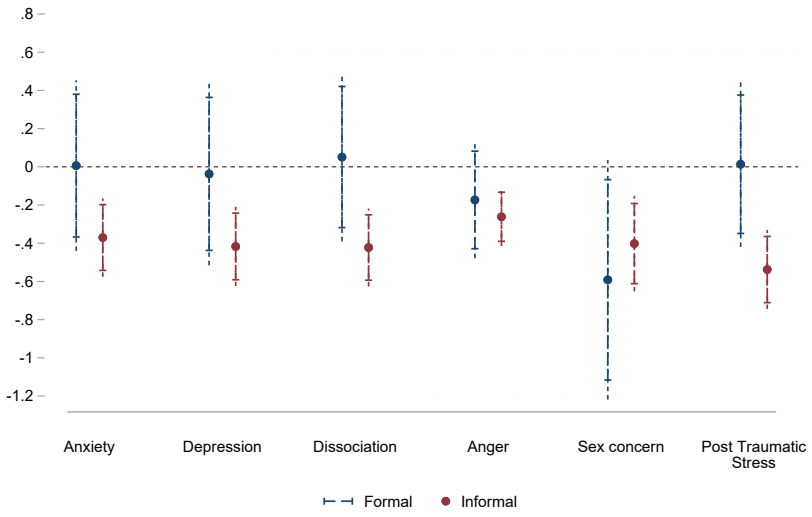


Figure A4: Seizure Location Map

