

UNDERSTANDING HOW VIOLENCE IMPACTS RURAL MEXICO:
A CROSS SECTIONAL ANALYSIS

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Abstract

Violence has negative impacts on the wellbeing of civilians, but it specifically has a stronger impact on the rural poor. In Mexico, the rural poor are often ignored in academic research and in policies that address violence, even though they have similar homicide rates to urban areas (Berlanga, Hernández, and Pérez, 2019; Villarreal, 2004). Mexico's census data from INEGI (National Institute of Statistics and Geography) and crime data from CONAPO (National Council of Population) was used in an OLS regression model to understand the impact that violence, location, and other socioeconomic factors has on wellbeing, which is defined as making at least two minimum wages per person. While violence was not found to be significantly impactful when location was included in the model, education was found to have significant impacts on if many people made above that vulnerable income threshold. The large impacts that simply completing primary school can have on the income vulnerability of people within rural communities can set the pace for future research and policies focused on this impact. Further, this research gives increasing awareness of the complexity of the impacts of rural violence and provides a basis for future research.

Introduction

Conflict and violence negatively affect livelihoods throughout communities and amongst families. More than 1.5 billion people live in areas affected by conflict (Breisinger et al., 2014), and 70.8 million people are forcibly displaced because of either conflict or persecution (The United Nations Refugee Agency, n.d.). The basic livelihoods of the rural poor are often hit just as hard, if not harder, by the impact violence causes because everyone in the community is hit by the death of loved ones or the other shocks that crime can cause. The violence that occurs in Mexico is not solely found in the urban areas, as it perpetuates throughout many of the rural areas in society, although often ignored in academic literature (Berlanga, Hernández, and Pérez, 2019; Villarreal, 2004).

In Mexico, approximately 34,500 homicides were reported in 2019 alone (Beittel, 2020), with approximately 60-70,000 homicides caused solely by drug and organized crime-related activities occurring between 2007 and 2015 (Shirk and Wallman, 2015). Further, an estimated 264,692 people have been displaced from their homes between 2006 and 2010 due to drug-related homicide and extortion (Contreras, 2014), and 380,000 people were estimated to have been forcibly displaced between the years 2009 and 2018 (Beittel, 2020). However, most of the focus within the literature on violence in Mexico has been on urban centers, as they have the most people and are often the center of drug trafficking in the country (Berlanga, Hernández, and Pérez, 2019; Villarreal, 2004). Many rural municipalities often have some of the highest homicide rates but are often overshadowed by urban cities because of the high death counts and because they are more well-known areas (Berlanga, Hernández, and Pérez, 2019; Villarreal, 2004).

Most of the literature that is available on rural violence as a phenomenon, both in the context of Mexico as well as in other places, focuses on cultural factors and small group dynamics, rather than the structural features and factors within these communities (Villarreal, 2004). Further, these studies focus on the role of statelessness and property rights as reasons for the presence of violence and have not taken into consideration the role that drug trafficking organizations and other criminal groups have had in this violence. Further, these sources all occurred before Mexico's focus on criminalizing drug trafficking, which may have initiated crimes in areas untouched prior.

A common assumption when looking at rural areas is to categorize them together, but there is not one homogenous framework for rural regions (Berlanga, Hernández, and Pérez, 2019) because of the plethora of indigenous cultures that may play a role in shaping their societies, and the differences in institutions and policies in different places, even within the same country (North, 1993). Understanding the setting and what changes it at different levels is crucial to get a full scope on how people develop and will be useful in understanding how violence or events outside of the immediate community may still impact the development or resilience of households (Bronfenbrenner, 1979).

Conflict literature shows that soldiers are not the only ones harmed in times of war, but civilians are also specifically targeted victims of acts such as theft, physical and sexual violence, extortion, or forced recruitment into military regimes (Lautze et al., 2012). With Mexico and drug trafficking organizations' crime, civilians may be maliciously murdered or kidnapped for ransom, among other things, to send a message or even simply for monetary gain, since many of the lower-level cartel members may not make very much themselves (Chi et al., 2014) and this matches what

Lautze et. al. (2012) found about militias in other developing countries. The assets that are necessary for communities to maintain sustainable livelihoods (Chambers and Conway 1991) are destroyed in times of conflict and start a cycle of poverty that is nearly impossible to end (Malual, 2008).

Many households, when being faced with becoming attractive to potential looters and violent perpetrators, will dwindle their agricultural assets to having only enough to survive as a means of protecting their homes and communities (Lautze et al., 2012), but this is not always effective and may also be a way that these communities become trapped in poverty (Lautze et al., 2012). Lautze et. al. (2012) state “powerlessness to protect assets (rather than asset poverty alone) is an appropriate indicator of vulnerability to the consequences and implications of protracted crises,” (p. 11) which clearly describes the importance of empowering communities with the ability to protect themselves and their assets. While this has not been studied directly in this circumstance with rural farmers in Mexico, this problem of violence encouraging to live with minimal assets may be reflected in the income per capita in rural areas, and the changes that people earn over the years. Studies of rural Mexico have not addressed this but may prove to be applicable to regions facing drug trafficking.

Conflict prevention within communities over the use of natural resources is the main subject of a majority of existing research on collective action. Hellin et. al. (2018) specify this greatly in their study of implementing collective action in Buena Milpa, Guatemala to help prevent conflict. They worked within the community and built institutions at the local level that helped create rules and regulations that were beneficial for all in helping manage natural resources. Some sources bring up that in areas where law enforcement is sparse, civilians have built their local militia to

defend against drug cartels or took on the role of justice-enforcing institutions themselves outside of government oversight. There are instances as well in Mexico specifically where civilians collectively protest and fight to protect. Sources like Lautze et. al. (2012) bring up the problem that arises with communities not being able to defend themselves from specific attacks, as stated previously, and thus consider the potential for collective action defense strategies as beneficial for helping communities increase their overall resilience to the shock that is conflict and its negative impacts. The International Food Policy Research Institute's social-ecological framework for resilience (Breisinger et al., 2014) clearly emphasizes the need to understand the context for which resilience-building should be enacted, and thus the need for a survey to best understand what actions should be taken to best fulfill this need in a way that meets actuality instead of perceived community and household needs.

The purpose of this research is to gain an understanding of the vulnerability that rural civilians specifically experience due to homicides in rural Mexico by looking at individual's income as a measurement for wellbeing. This research will look at how levels of intentional homicides impact the wellbeing of the people who live in rural municipalities in 2015. Understanding how homicide rates impact income in rural regions can shed light on the impact of violence on economic wellbeing and provide future research and development actions to build programs and policies that contribute to resilience and improve the wellbeing of rural Mexican civilians, and provide means to better prepare for this type of shock. While this research is quantitative, qualitative information describes the context of the different rural states that informs the types of policies that may be recommended for further research and analysis.

Research questions

1. Does an increase of homicide within a rural community have a negative effect on income, and thus wellbeing?
2. How are rural municipalities impacted by violence?

Literature Review

Recent History and the Current State of Violence in Mexico

In December of 2006, newly elected President Felipe Calderon of PAN (National Action Party) declared fighting organized crime to be Mexico's top priority, changing the government strategies combating drug crimes (Calderón et. al., 2015; Chi et. al., 2014; Contreras, 2012; Martinez-Palomares, 2019; Piaggio, 2019). Since the enactment of Mexico's "War on Drugs", given its name after its similarity to the initiative in the United States, violence has only increased in the country (Calderon et. al., 2015; Contreras, 2012; Dell, 2015). The only areas that experience these increases in violence are where members of PAN have been elected (Dell, 2015; Martinez-Palomares, 2019; Piaggio, 2019). Further, Dell (2015) states that the shares of Mexican heroin and other Mexican drugs in the U.S. markets have significantly increased since Calderon's crackdown. The amount of drug trafficking organizations (DTOs) in the nation has also increased from the original six to nine before many of those DTOs further fragmented into sixteen different cartels (Calderón et. al., 2015; O'Dowd & Hagan, 2020; Chi et. al., 2014). Their influence in Mexico covers more than two-thirds of municipalities (Dell, 2015).

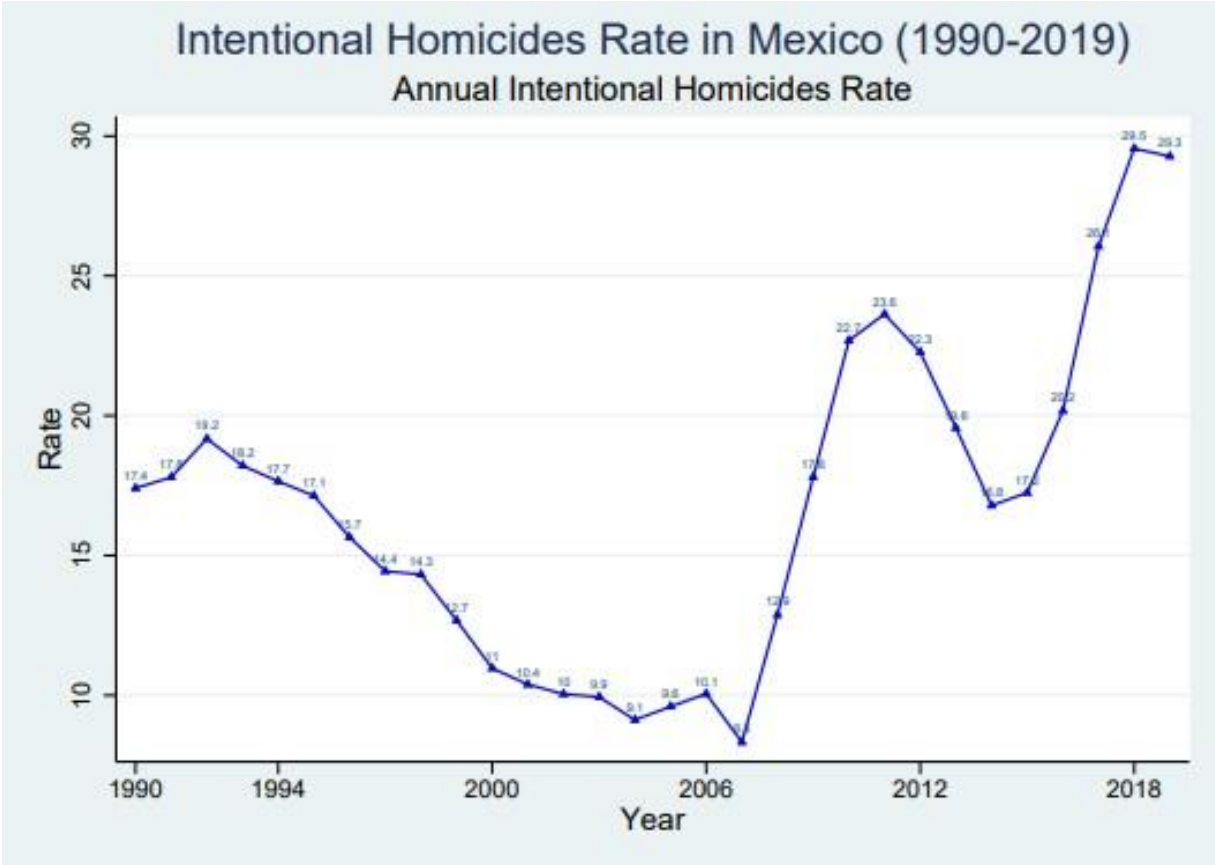
PAN officials seem to bring about heavier crackdowns, according to Dell (2015), and thus cause more violence. More than 50,000 drug-related deaths were registered between 2006 and 2011 (Calderón et. al., 2015; Contreras, 2012). The annual homicide rate is shown in Figure

1. Spearheaded by Mexico's conservative party, PAN, this initiative now costs about \$9 billion USD annually (Chi et. al., 2014; Dell, 2015). Mexico's "War on Drugs" has drastically shifted the government's strategies to combat drug crimes. In a country so heavily decentralized (Rowles et

al., 2018), national-level government involvement is less common and, when national law enforcement gets involved, violence often increases in those areas (Contreras, 2012). Confrontations between law enforcement and DTOs create shockwaves through these drug trafficking organizations, leading to direct effects of crackdowns in the communities (Contreras, 2012). These initiatives more often just simply divert drug trafficking to other places instead of eradicating it (Contreras, 2012). Costs for traffickers are often increased as well when drug markets have to divert products because there may be an increased risk of business and it may be more expensive to transport (Dell, 2015). This is how increases in the crackdowns in one municipality may modestly increase the homicide rate in another (Dell, 2015).

The president dispatched nearly 7,000 federal forces to deal with feuding gangs responsible for some 500 murders in 2006 alone (Beittel, 2020). The Mexican government had increased this number to 50,000 troops by 2011 without putting into place hardly any programs to help Mexican youth economically prosper (Chi et. al., 2014). Nearly half of all current inmates in Mexico are charged with drug-related crimes, showing that the government is capable of arresting criminals (Dell, 2015). However, arresting and killing these kingpins destabilizes drug cartels, leaving civilians more at risk of being attacked and increasing the chances of and overall rates of violence (Calderón et. al., 2015; Contreras, 2012). The presidential leaders succeeding Calderon have seemed to follow suit, implementing similar policies and having unsuccessful results in trying to reduce the flow of drugs (Chi et. al., 2014). Andrés Manuel López Obrador, Mexico's most recently elected leader, instituted a National Guard that had trained 60,000 soldiers in the fight against drug cartels (Piaggio, 2019).

Figure 1. Intentional Homicides Rate in Mexico



INEGI Instituto Nacional de Estadística. (2019)

Increases in DTOs have led to increased rates of homicide and other crimes (Calderón et. al., 2015). This increased exposure to violence has not only impacted those closely involved with drug trafficking and gangs, but also the more vulnerable adolescents that live in these areas. Turf wars and increased exposure to violence directly led to decreased math test scores in elementary and middle schools, especially in urban areas that also experience poverty (Jarillo et. al., 2016).

Jarillo's (2016) study shows that this is due to more absences from both students and teachers, as well as less instructional time overall.

Many cartels have diversified their economic portfolios to include agricultural and other legal and profitable activities, along with crime. For example, unlike throughout most of history,

drug cartels are getting more involved in kidnapping, extortion, and oil theft (Beittel, 2020). Other economic ventures that drug cartels take part in are the production of agricultural goods, like avocados. They first promised protection for many of these farmers and their livelihoods and earned profits in return. However, they also sought to gain control of lands and of the inputs that go into agricultural production, especially water-intensive avocados (O'Dowd & Hagan, 2020). The idea that cartels that do not have drug-related deaths may be beneficial to communities has not been proven, and most evidence found thus far proves it to be false according to Gutiérrez Romero and Oviedo (2018) as unemployment and poverty are unchanged.

Mexico's War on Drugs has drastically shifted the government's strategies to combat drug crimes. In a country so heavily decentralized (Rowles et al., 2018), the increase in enforcement also increased how violent these groups would respond (Contreras, 2012). The confrontations that these military groups have created shockwaves through these organizations, resulting in direct effects of crackdowns on the communities, and often simply diverting drug trafficking to other places instead of its eradication (Contreras, 2012). Dell (2015) and Werb et. al. (2011) agree with this, showing that increases in enforcement have led to great increases in transportation costs because of the need to change routes, and increased risk. This is how the crackdowns in one municipality may modestly increase the homicide rate in a neighboring region (Dell, 2015). Keeping this in mind shows that not only does violence over time need to be monitored after policies take place, but also in the neighboring places where these routes may have changed toward.

When people do not feel safe leaving their homes at night, there are decreases in consumption and economic activity (Calderón et. al., 2015). Bel and Holst (2018) and Enamorado et al. (2014) show that increases in homicide rates have a statistically significant negative impact on

Mexico's economy. There is a direct economic correlation between increased homicide rate and increased unemployment rates, and a decrease in the number of people working, which results in less economic activity (Gutiérrez-Romero & Oviedo, 2018; Calderón et. al., 2015). There is also a decrease in the number of business owners, as businesses in Mexico have been forced to close permanently or move to other countries or municipalities due to the insecurity in a community (Gutiérrez-Romero & Oviedo, 2018; Calderón et. al., 2015). In the time between 2006 and 2011, approximately 1.6 million Mexicans have had to flee their homelands, with many of them leaving their rural livelihoods for places that have few to no job opportunities (Chi et. al., 2014).

The Context of Rural Mexico

Eight states in Mexico have a majority of the population living in rural areas. Each of these states and their rural municipalities experience varying levels of violence, with different levels of government involvement, and a diversity of indigenous groups and cultures present. Because there is so much of variance in factors that make up the context of *rural* Mexico, aggregate data and analysis is not fully encompassing. Further, while an in-depth analysis of each municipality and indigenous group cannot be provided, an overview of each of the eight states is. As previously stated, Berlanga, Hernández, and Pérez (2019) used Chiapas, Guerrero, Hidalgo, Nayarit, Oaxaca, Tabasco, Tlaxcala, and Veracruz in their study of rural violence in Mexico, and these same states will be described in further detail. See Figure 2 for a comparison of each of the stated eight rural states' homicide rates with the national average of every state's intentional homicide rate combined.

Pietersen et al. (2018) explain that almost two thirds of the rural population would be considered peasant farmers, earning wages far below the national rural poverty lines. In Mexico,

73% of the rural livelihoods are subsistence family farming, with no market access (Alamilla Magaña et al., 2020). Half of the land is owned as *ejidos*, which are collective landholdings that are managed by groups of peasants for more resilient livelihoods (Pietersen et al., 2018). However, as Lanzas & Whittle (2017) describe, when faced with shocks and hardship, some peasant families have resorted to selling their personal parcels illegally to make ends meet. In other cases, these families also may take out agricultural loans in areas where microcredit systems have been put into place and use them for household consumption needs instead (Lanzas & Whittle, 2017; Pietersen et al., 2018).

Verner (2005) closely looks at the labor and earnings situation in the late 1990s and early 2000s and found even then those agricultural incomes were not the sole means of livelihoods for rural populations, but that labor was the most important asset when employed off the farm as it could garner the highest wages. When analyzing markets, he also found that increases in years of education directly lead to an increase in wages earned when analyzing rural and semi-rural labor markets (Verner, 2005). Education was also found to be a key explanatory variable in reducing inequality in less developed nations, according to Permanyer and Smits (2019). Further, populations in localities of less than 15,000 people, earned less than similarly situated people from semi-rural areas with larger populations (Verner, 2005).

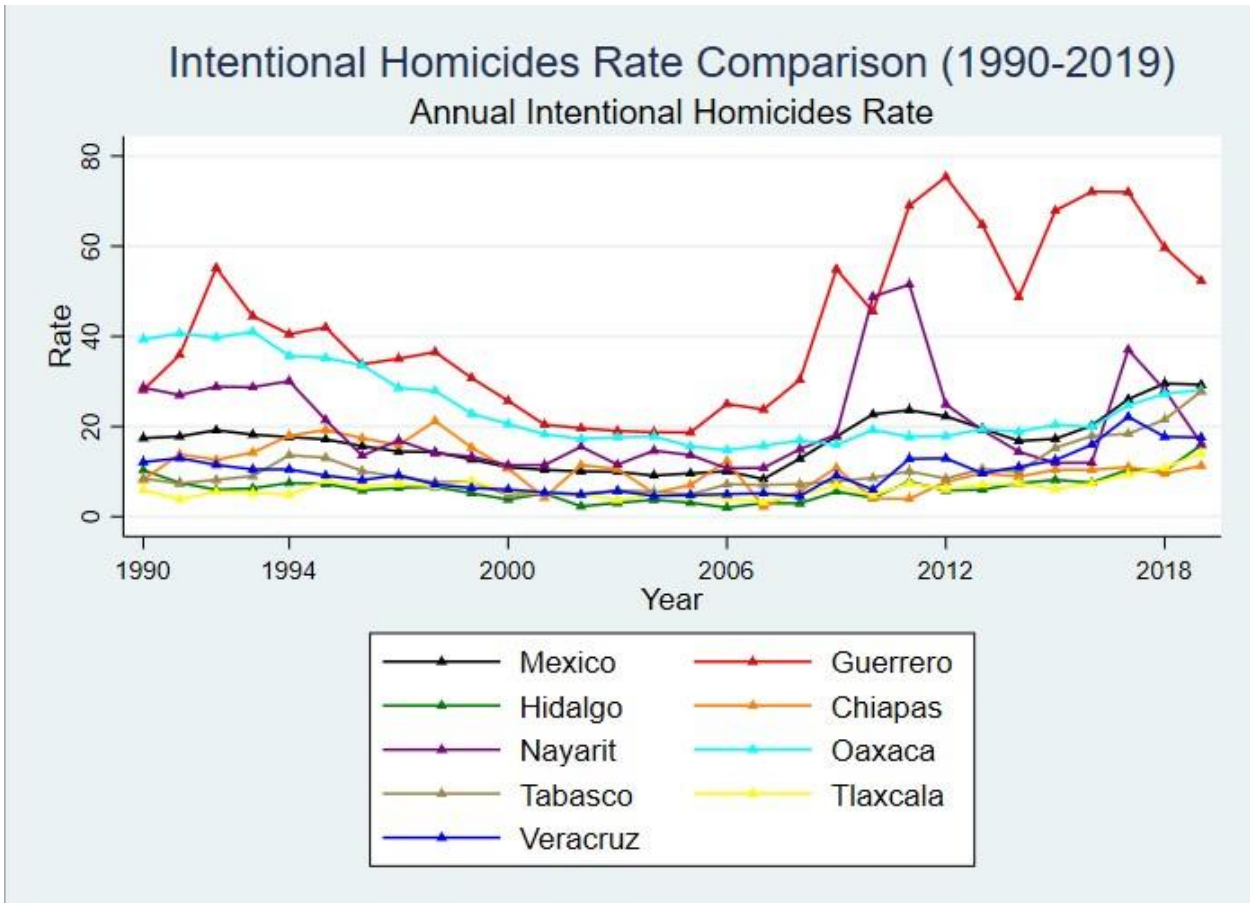
Esquivel (2000) shows that different geographic factors have played the largest role in determining regional inequality. Most clearly, the climate and agricultural productivity of an area has historically helped guide where humans have settled and where initial development flourished (Esquivel, 2000). Location and ease at which trade could occur with neighboring nations or communities, or even the likelihood of weather disasters, could also incentivize or disincentivize

the performance of an economy (Esquivel, 2000). The Southern and Southeastern region of Mexico that include Oaxaca, Guerrero, Veracruz, and Chiapas, hold about 70% of North America's biodiversity (Alamilla Magaña et al., 2020).

Guerrero is the most violent and one of the poorest and most marginalized states in the nation. It is a rural and highly agricultural state with a large indigenous population (Berlanga et al., 2019). A majority live in La Montaña region of Guerrero, which is highly rural, marginalized, and impoverished (Galicía Gallardo et al., 2021). According to Berlanga et al. (2019) the municipalities with the higher presence of indigenous populations are the least violent. However, Teresa Sierra (2010) describes Guerrero's longstanding history of mobilization of armed guerilla groups and human rights organizations, often spearheaded by indigenous people groups, fighting for their own rights and autonomy. Many of these indigenous communities have created their own community police that enforce indigenous ways of conflict) resolution and regulation but are usually not recognized by state and national law, and are considered illegal (Teresa Sierra, 2010). Much of this guerilla uprising has been due to the deforestation, illegal logging, and other environmental destruction that has occurred and negatively impacted indigenous peoples (Durán et al., 2011). Drug cultivation, boundary disputes, and state violence have also been well known sources of violence in the state (Durán et al., 2011).

Oaxaca is one of the poorest and most marginalized states in the nation, with high rates

Figure 2. Intentional Rural Homicides Comparison



INEGI Instituto Nacional de Estadística. (2019)

of infant mortality and a high prevalence of water quality and disease issues (Rowles et al., 2018). They are governed at the municipal level and have traditional assemblies that put forth their policy decisions on public goods (Magaloni et al., 2019; Rowles et al., 2018). Known as a state that is fairly violent and bordering Guerrero, Oaxaca has the most violent rural municipality in the nation (Berlanga et al., 2019). A large proportion of Oaxaca is not arable, and unlike what could be expected in areas and states that are mostly rural, there is only a small percentage of state GDP from agricultural activities (Schmal, 2019c). This could mean that there are not many farmers or

agricultural laborers within these communities, or if there are that they are not high earners, or mostly produce for their own consumption. Oaxaca also has many indigenous language speakers which, according to the 2010 census, made up almost 40% of the population of this state (Schmal, 2019c). While population is increasing steadily in both Guerrero and Oaxaca, there is also a greater net out-migration because of the increase in drug cartel violence and presence within these states (Azuz-Adeath, Rivera-Arriaga, and Alonso-Peinado, 2019).

In Nayarit, Del Nayar, La Yesca, and Huajicori are the most remote municipalities, and are the most difficult to access (de Haro Mota et al., 2017). Thus, their citizens have access to fewer health and educational services (de Haro Mota et al., 2017). The 1,037 localities that make up these three municipalities cover 42% of the state's surface and are considered semi-rural or rural in population size (de Haro Mota et al., 2017). More than 10% of Huajicori speak the indigenous language Tepehuán (Schmal, 2019b), and the municipalities with the most inequality are considered to have a high proportion of indigenous populations (de Haro Mota et al., 2017). Subsistence agriculture is practiced throughout this region in addition to fishing, hunting, and gathering as economic activities that complement their subsistence agriculture, and some take on seasonal agricultural employment along the coasts (de Haro Mota et al., 2017). While there is a fair amount of economic activity in Huajicori in comparison to other municipalities in Nayarit, de Haro Mota et al. (2017) show that there is little density of paved roads, a very low level of economic development, a high marginalization index, and an economic activity rate below the state average (de Haro Mota et al., 2017).

Chiapas, which borders similarly rural states Tabasco, Veracruz, and Oaxaca, is also one of the poorest and most marginalized states in the nation (Rowles et al., 2018). About 40% of the

population both here and in Oaxaca has no municipal water supply and have difficulty accessing safe water (Rowles et al., 2018). These people are often found to be the most impoverished. A study of the health of young children in both rural highlands and urban areas showed that those in impoverished rural areas within the state had a high prevalence of intestinal parasites (Gutiérrez-Jiménez et al., 2019). The state of Chiapas is the second-largest agricultural producing state in all of Mexico and being the source of more than a third of Mexico's coffee, the relationship between its indigenous heritage, agricultural production, and the history of the Zapatista movement (Schmal, 2019d) are factors to consider in understanding the full context of violence in the rural municipalities of Chiapas. For perspective, the Census of 2010 showed that Chiapas has a significant proportion of indigenous people with Mayan heritage. Indigenous language speakers make up more than 90% of the population in twenty-two municipalities, and more than 50% of the people in more than thirty-six municipalities, according to the Census (Schmal, 2019d).

Hidalgo, known as one of the most peaceful states in Mexico (Berlanga, Hernández, and Pérez, 2019), has become an established center for industrial and agricultural production (Schmal, 2019e). Almost 19% of citizens work in agriculture and including these more than half of the citizens work in agriculture, manufacturing, and commerce (Schmal, 2019e). Specifically, Hidalgo is one of the ten main coffee producing states in Mexico, and is a main exporter for the nation's supply (García-Barrón et al., 2021). In addition to agriculture production, it has historically been a reserve of minerals and metals, such as manganese, gold, and silver (Schmal, 2019e), and both men and women within the state earn a living from mining (Lutz-Ley &

Buechler, 2020). Some rural areas have become a new area for tourism development as well (Franco & Zamudio, 2021). About 36% of the population of Hidalgo considered themselves culturally indigenous in 2015, with many in large groups in semi-rural or urban municipalities except Huazalingo (Schmal, 2019e). The state is considered safe in comparison to other rural states, it has the sixth smallest surface area of any state and has a high level of poverty (Castro, 2017).

Veracruz is an east coast state that has a well-established agricultural industry, with significant agricultural and livestock development, large ports for both fishery and commercial uses, and overall bustling with economic activity (Azuz-Adeath, Rivera-Arriaga, and AlonsoPeinado, 2019). It has the only nuclear power plant in the nation and has the second largest population of any state, second only to Jalisco (Azuz-Adeath, Rivera-Arriaga, and AlonsoPeinado, 2019). Veracruz has the largest percentage of indigenous people in their state, and 10.9% of their population speak an indigenous language (King, 2007). Veracruz is considered marginalized, as it has pockets of poverty that coincide with where its large indigenous population reside (King, 2007). These marginalized communities are often isolated with poor road quality and no transportation infrastructure in the area (King, 2007). However, these municipalities still have access to health care, electricity, and primary schools (King, 2007). Their rural agricultural communities are home to subsistence peasants that often can produce small quantities of excess to send to local markets to bolster household incomes (King, 2007).

Tlaxcala is the smallest state but also the most densely populated state in all of Mexico (Eakin, 1998). A low percentage of citizens identify as being of indigenous heritage, although most of their citizens are native to Tlaxcala, and they are fairly young as the population in 1998 had an

average age of 18 years (Eakin, 1998). Parts of Tlaxcala lie in the fertile soils, while others are in areas of poor soil with difficult growing conditions (Eakin, 1998). The poverty rate of Tlaxcala is better, closer to urban areas, and increases the further away from an urban center a community is (Eakin, 1998). Finally, Tlaxcala is unique in that, unlike any of the other rural municipalities, it is the only one in which there is more violence in the rural areas than in urban municipalities (Berlanga et al., 2019).

Finally, Tabasco is a coastal state that faces the Gulf of Mexico and borders Veracruz, Campeche, and Chiapas (Atreya et al., 2017). The state has the two largest rivers in the nation, and has the largest watershed in North America which, along with wetlands, lagoons, and lakes, is highly vulnerable to flooding (Atreya et al., 2017). Because of this, many communities are annually in state of vulnerability already from flooding (Atreya et al., 2017). This state has incredibly fertile land and lies close to the equator in a zone great for agricultural production of crops such as cacao, bananas, and sugarcane (Avilez-López et al., 2020). In addition to having livelihoods based in agricultural production, many rural civilians also earn a living in the services sector, as tourism is heavily promoted throughout the state (García Álvarez et al., 2017), and in the oil industry (Avilez-López et al., 2020). Different shocks due to flooding and deforestation have led to fewer economic opportunities for many of the rural areas (AvilezLópez et al., 2020). Of all, the state of Tabasco is fourth in the nation for economic activity and has the highest level of economic activity of all the states in its region (García Álvarez et al., 2017).

Rural Violence in Mexico and what has been found from other countries.

Rural violence, while acting in some ways like violence in more urban areas, is also unique in its communal impacts. Smaller communities are often not only impacted physically, through the

destruction of markets (Justino, 2009) and infrastructure but also socially, because of the interwoven nature of the lives of neighbors within small communities (Berlanga et al., 2019). Berlanga et al. (2019) describe that because of the widespread presence of violence in urban regions, rural areas with high levels of violence are often ignored and marginalized. The security strategy of the nation often leaves out plans that incorporate tackling rural violence, leaving local authorities left to handle situations beyond their capabilities without any reinforcement (Berlanga et al., 2019).

Durán et al. (2011) studies the correlation of deforestation and violence within Mexico, stating “Mexico has on average higher rates of homicides in rural areas that have been associated with electoral competition, unequal land distribution, cash crops such as coffee and cattle, and remoteness”. While not specifically elaborated on within this study, understanding that there are other factors that contribute to violence in rural areas specifically in ways that are not and cannot be issues in urban areas is crucial to understanding the significance of studying the rural violence phenomenon. Further, understanding if rural violence is indeed an issue can also help further understand what research needs to be done and which of the factors that are associated with rural violence need to be addressed, and what can be done at a policy and infrastructural level.

Justino elaborates on how households experience reductions in food security through threats to their livelihoods as markets are disrupted because they cannot travel to markets to trade goods, resulting in loss of earning capacity, and their networks for exchange (Justino, 2009). Lautze et al. (2012) discuss, as will be elaborated in later paragraphs, that having assets can create liability, as it may attract violence if another entity wants to gain control of it. Household compositions are changed due to the killings, injuries, and recruitment of their young men that are targeted to fight

for these militias (Justino, 2009). In Justino's writing on civil conflict and household welfare, she explores the circumstances of the men targeted for recruitment into these military regimes as they often have a lower opportunity cost of joining (Justino, 2009) because there are few opportunities for earning an income for their families and having a sustainable livelihood. Collier, Hoeffler, et. al. (n.d.) find that fighters are paid for enlisting, and typically choose to fight because they are getting paid a higher wage than what they would have been making and cannot go on for further education.

Theoretical/Conceptual Framework

Theories on Peasant Farming and Sustainable Rural Livelihoods

A large proportion of the world's population would be considered peasants, which Ellis (1993) defined as those "which derive their livelihoods mainly from agriculture, utilise mainly family labour in farm production, and are characterised by partial engagement in input and output markets which are often imperfect or incomplete" (p. 13). He studied and investigated how peasants live and interact specifically at the household level since there are common norms that family members take on that are often unique to their gender and position within their family unit. Their access to land is the basis of their livelihood, since their work is based around farming and agriculture, and they have a strong reliance on family labor from each productive member of the household. Their family is their enterprise, so they run a full household instead of having a separate business because they earn just enough or slightly above what they need to survive (Ellis, 1993).

While income and consumption are measurable variables that in some cases can measure deprivation and wellbeing, sustainable livelihoods also include the ability to satisfy basic needs and handle shocks and stressors as these arise (Chambers and Conway, 1991). Sen defines capacity within this framework of wellbeing as "a set of operations (being and doing) that reflect the freedom of a person to choose one type of life or another" (1992, p. 40). Peasant populations, because they produce just enough to sustain themselves, are highly vulnerable to shocks in their setting and environment or within the household itself. Shocks are typically highly unpredictable events that are traumatic and affect the entire community and cause this vulnerability (Chambers

and Conway, 1991). Wars, persecution, and civil violence are found to impact the whole community (Chambers and Conway, 1991), as well as armed conflict from the state and, in the context of small localities, even homicide (Ellis, 1993). Uncertainty and risk experienced in these agrarian societies can be reactive (Chambers and Conway, 1991), and can lead to what Ellis (1993) describes as “peasant conservatism” in which new practices and inputs are not quickly adopted until there seems to be minimal risk in their adaptation. Many of the imperfect markets that peasant households work within are highly unstable from the lack of information they have, and these issues are not ameliorated until there are higher levels of market integration or increased access to information available in these markets.

Public capital, as coined by Winters, et. al. (2002), which is how governments invest in the livelihood strategies of communities, is likely to be higher in some areas than others.

Poverty can become cyclical in a way that is almost impossible to escape, especially in areas of conflict where this can be perpetrated more easily, because of how it impacts the resiliency of those in these violent areas. One of the shocks that can send a whole community into a poverty cycle is violence or conflict. Conflict may strike an area, causing businesses to migrate out and leaving people without employment and opportunities. Civilians in this context may have no other employment opportunities or any viable options, other than joining one of the violent groups involved in the conflict or leaving the community (Sen, A., 1992). These shocks and others like these put strains on the capacities of communities to value and give themselves real abilities to get out of or avoid getting into poverty (Sen, A., 1992). Further, there is no incentive for governments to develop in these regions or for businesses to start in these areas because of the greater risk of the capital invested being destroyed in the war (Sen, A., 1992).

This perpetuates the lack of jobs and opportunities that starts the cycle back again.

In areas where violence is prevalent, seeking to help people survive in the short run is often prioritized over development (Chambers and Conway, 1991). However, supporting the development of communities to enhance capabilities can contribute to build resilience in the face of shocks, moving out of a desperate state of survival. Being able to build even greater opportunities for employment in agriculture by increasing marketing power and incomes may help families build resilience not only to income shocks but to environmental shocks impacting their communities (Curtis, 1993; Key et al., 2000; Omamo, 1998).

Socio-Ecological Resilience Framework

Resilience is the ability to absorb a shock and restructure while trying to maintain function and form as much as possible (Walker et al., 2004). The International Food Policy Research Institute's (IFPRI) Food Report (2014) illustrates a framework in which conflict is described as a specific type of shock that risks security at a national as well as local level and can happen along with other shocks that add even further complexity to emergency situations. IFPRI's report compares actions taken at the national level to build resiliency and ensure food security, as well as how household-level resiliency and food security can be done most effectively by international partners as well as local-level governments.

A key way that households build resiliency is by diversifying their economic portfolio (Ellis, 2000). Having multiple avenues of income ensures that households are still earning income and can provide for their needs when their primary job, or income source, does not earn enough to survive (Ellis, 2000), or when faced with a shock that harms their source of income. Income

diversification may also be a proactive choice made by the household to garner more income to become more resilient in the face of shocks, such as when households send out a family member as a migrant worker to garner wages elsewhere and send these back home to their family (Ellis, 2000).

In many of the rural states migration has recently taken place, such as Hidalgo, Tlaxcala, Oaxaca, Guerrero, and Veracruz. On the other hand, Nayarit and many more urban states have had migrant workers throughout history (Vega Briones and Huerta Rodríguez, 2008). These states specifically receive remittances from migrant family members working in the United States, and are of significant importance to the rural communities that often receive these (Vega Briones and Huerta Rodríguez, 2008). Vega Briones and Huerta Rodríguez (2008) studied Hidalgo and Nayarit specifically, where families often have an older woman as the head of their family. Many families with low levels of schooling, consist of smaller nuclear or extended family members living in the same household (Vega Briones and Huerta Rodríguez, 2008). These remittances are often used to provide basic needs for the households in Mexico, such as clothing, food, medical needs, schooling, and household equipment, with occasional instances of investment for productive assets and in buildings (Vega Briones and Huerta Rodríguez, 2008). Households that receive remittances have higher incomes, earning in total anywhere from one to four minimum wages-worth, in comparison to households that do not receive remittances that earn one minimum wage monthly (Vega Briones and Huerta Rodríguez, 2008).

Development efforts are to be focused on sources of violence and organized crime-related issues, including addressing the opportunity costs and motivations for civilians themselves to become involved in conflict and crime organizations. Lautze et. al. (2012) find in their study of Northern Uganda that many men had the opportunity to get a salary and were provided security in

the military regime as soldiers, neither of which were afforded to them in other livelihood activities. While many resiliency factors are similar throughout many communities, policies and programs need to be context-specific to bring about the best possible outcomes for the conflict-afflicted communities (Breisinger et al., 2014). This framework can be applied similarly within the context of Mexico and the interactions of organized crime organizations, such as drug trafficking organizations, to understand why young men get involved in cartels. For example, while some areas may have adequate law enforcement and programs to help steer adolescents from taking up criminal activities, in states like Guerrero that are highly impoverished and do not often get adequate resources, some rural and indigenous communities may build up their own community police force and apply their own traditional systems of justice (Teresa Sierra, 2010).

Research Hypothesis

The percent of the population earning up to two minimum wages in a municipality is impacted by the access to public capital, human capital, quality of dwelling, access to services for a dwelling, closeness to cities, and violence.

The main dependent variable estimated is income, which is measured as the percentage of the population within each municipality that make two minimum wages or less. The minimum wage for the year 2015 was 70 pesos a day, or about \$5 USD (Harrup, 2014), so this would be those people earning 70 or fewer pesos daily on average. This level of income per person is a threshold for understanding if people are vulnerable, meaning that they are on the precipice of being impoverished. This determination of being vulnerable is based upon their incomes, judging if they make enough money as an entire household to sustain themselves. People that make in total

the equivalent of two minimum wages are determined to not be vulnerable, because even in the face of minor shocks, are likely to be able to still, even if minimally, provide for themselves. Therefore, this variable represents how many people are economically vulnerable in each municipality.

The first independent variable is violence, which takes the number of intentional homicides within a municipality and adjusts it to be an intentional homicide rate, per 5,000 citizens. Homicide rates are normally per every 100,000 citizens, but because the municipalities in consideration are all rural with less than 15,000 citizens in each, the rate is adjusted accordingly. Violence is a type of shock that can shake up a person or household (Bronfenbrenner, 1965) in a position of vulnerability, and thus is included in the study to understand how it impacts income vulnerability.

The other variables are the rest of the socioeconomic variables. The first measures education, which is measured by the lack of completion of primary school by citizens 15 years of age and older. Literacy is another measure of human capital, as many people may learn to read and write outside of a formal education system or may have had a poor quality of education where they did not learn to read or write. Illiteracy is strongly correlated, with a value of .9, to primary education in the context of rural Mexico within these states. A strong correlation level is considered above .7, and so it was determined from this matrix that only one of the education variables would need to be included in the study (Mindrila and Balentyne, 2012). When choosing which human capital variable would be best to include in the study, lack of primary school completion was shown to be more significant than illiteracy, and thus was included as the human capital indicator. Table 1 shows the matrix of correlation, which further shows that the socioeconomic variables

included in this study do not correlate, while the two potential education variables, illiteracy, and lack of complete primary school education, do. Thus, only primary school education is included.

The other independent variables are all different measures of the quality of the physical household, and the dwelling. The drainage variable describes if some type of sewage and drainage system for human waste is not present within the dwelling, which can be in the form of a public sewage system or a septic tank. The electricity variable measures the percentage of homes without electricity. Both electricity and sewage systems give context clues to the state of public infrastructure within the communities these households are in. Communities may be lacking in other areas of providing for the communities if basic utilities are not offered to the community. Next is the lack of presence of running water within the household. The following variable measures overcrowding, which is defined as having an average of 2.5 or more people per room in the house. Being able to have running water and having overcrowding can show the ease at which households are able to maintain good health (National Council for the Evaluation of Social Development Policy, n.d.). This measure does not define people by any specific age range or relationship but does define that hallways and bathrooms are not part of the rooms in the total count while kitchens can be included. The final variable in the core model is the presence of any dirt floors throughout the household. The presence of dirt floors is found by Cattenao et. al. (2007) to be significant in improving the well-being of Mexican community members, when studying the impacts of the Mexican government's *Piso Firme* program that offered households with dirt floors up to fifty square feet of cement flooring. In young children, cement floors were found to be effective through its improvements in reducing parasitic infections, diarrhea, and anemia, while improving their cognitive development (Cattenao et. al., 2007). Further, replacing dirt floors with

cement floors improved the satisfaction in quality of life and housing in adults, and reduced negative mental health impacts such as perceived stress and depression (Cattenao et. al., 2007).

The final variable measured in the first and second regressions is the size of the locality that people within a municipality live in, which is measured by a percentage of the total municipality's population. This measurement specifies what percentage of the municipality's population lives in a locality, or town, with five thousand people or fewer within it.

In the second run of the model, the primary education variable was squared to see if it had a consistent impact as the percentage of the population that had no primary education was consistent (Winters, 2002). Education was shown through this to be curvilinear, and thus the impact that education has is less the closer a community has to almost no one with primary school education and it is less impactful the closer a community is to having every citizen having completed primary school education.

Berlanga, Hernández, and Pérez (2019) study the phenomenon of rural violence in the most violent and least violent states, specifically noting which of these were rural. As of 2017, of all eight rural Mexican states, Guerrero had the highest intentional homicides with a rate of 64.3, while Hidalgo had the lowest rate with only 6.2. Guerrero is the third most violent state of Mexico, while Hidalgo is the fourth-least violent state. Guerrero, Morelos, Guanajuato, and Colima were the states used in their study because of the known presence of specific drug cartels in these regions. However, since rural violence in Mexico is not entirely due to the presence of drug cartels, this study will include all the rural municipalities within the eight rural states to get a complete perspective of the rural violence situation. These states, as previously described in the literature, are

Table 1. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1) Income up to 2 minimum wages	1.00																		
(2) Violence	0.04	1																	
(3) Illiteracy	0.48	0.7	1																
(4) Incomplete Primary Education	0.55	0.8	0.1	1															
(5) No Drainage	0.07	0.4	0.3	0.7	1														
(6) No Electricity	0.14	0.8	0.5	0.4	0.1	1													
(7) No Piped Water	0.20	0.1	0.3	0.0	0.0	0.9	1												
(8) Overcrowding	0.43	0.8	0.9	0.4	0.6	0.0	0.5	1											
(9) Dirt Floor	0.26	0.7	0.6	0.6	0.4	0.6	0.5	0.8	1										
(10) Small Town	0.19	0.8	0.7	0.6	0.9	0.1	0.2	0.2	0.6	1									
(11) Education ²	0.49	0.3	0.8	0.3	0.5	0.3	0.9	0.1	0.3	0.1	1								
(12) Chiapas	0.32	0.1	0.18	0.0	0.1	0.08	0.00	0.2	0.7	0.2	0.17	1							
(13) Veracruz													1						
(14) Tabasco	0.08	0.09	0.23	0.32	0.07	0.12	0.16	0.11	0.18	0.08	0.24	0.07	0.12	1					
(15) Hidalgo	0.21	0.16	0.18	0.29	0.04	0.12	0.13	0.26	0.24	0.01	0.25	0.12	0.05	0.05	1				
(16) Oaxaca	0.06	0.08	0.2	0.7	0.20	0.04	0.04	0.3	0.5	0.3	0.3	0.30	0.12	0.22	0.03	1			
(17) Tlaxcala	0.09	0.17	0.13	0.9	0.17	0.11	0.06	0.24	0.23	0.09	0.02	0.22	0.09	0.16	0.37	0.00	1		
(18) Nayarit	0.11	0.02	0.11	0.11	0.06	0.4	0.05	0.07	0.05	0.05	0.10	0.06	0.02	0.04	0.10	0.07	0.02	1	
(19) Guerrero	0.03	0.06	0.9	0.6	0.0	0.2	0.6	0.2	0.0	0.1	0.05	0.16	0.06	0.11	0.27	0.20	0.20	0.05	1.00

INEGI Instituto Nacional de Estadística. (2019); Minnesota Population Center (2020)

Chiapas, Guerrero, Hidalgo, Nayarit, Oaxaca, Tabasco, Tlaxcala, and Veracruz. The third regression included dummy variables for each of the states to understand the impact that being in a specific state had on violence and the other socioeconomic variables. To avoid the dummy variable problem, Chiapas was taken out of the main regression automatically by the STATA software. However, when analyzed separately, it was not found to be significant and thus does not impact the outcome of this study.

This is a cross sectional regression analysis using data for 2015 of household socioeconomic data, found from INEGI, and intentional homicide data for 2015 collected by CONAPO (National Council of Population).

Research Design/Methodology

The study design cross-sectional regression analysis of the relationship between the rate of homicide in a region (municipality) and the percent of the working population that earn up to two minimum wages, controlling for different factors that impact households earning ability. The independent variables include education (primary education), public capital (access to sewage and indoor plumbing, and the presence of electricity), physical capital (presence of dirt floors and the presence of overcrowding), access to services and education (measure for if the household is in a locality, or town, of less than 5,000 people), as well as location (the dummy variables for each rural state) (Bebbington, 1999; Winters, 2002). The data used is from the year 2015, which was chosen because of the significance it has in coming after much of the policy focus on enforcing drug involvement occurred within the Mexican government, while coming before a major spike in intentional homicides seen in the entire country, as shown earlier in this paper. Further, while the

crime data is measured annually, the census with all the household socioeconomic data is only taken every 5 years, placing 2015 as the most recent year at the time this analysis was done.

CONEVAL (National Council for the Evaluation of Social Development Policy) measures poverty and deprivation through multiple dimensions such as current per capita income, the educational gap, access to health services, access to social security, quality and spaces of the dwelling, access to basic services, access to food, and degree of social cohesion (National Council for the Evaluation of Social Development Policy, n.d.). The CONEVAL's multidimensional poverty measurement uses household data found through INEGI to define deprivation, including the nine socioeconomic variables used in this study.

For the educational variable, CONEVAL speaks to the importance of education in investing in the education of a person in order not to limit their cultural and economic perspective, and that one who does not meet the basic education minimums for their age is deprived (National Council for the Evaluation of Social Development Policy, n.d.). Completing secondary school is considered is a mandatory requirement for those who were born from 1982 onward, while completing elementary school (also known as primary school) is the minimum for those born before 1982. Those also between the ages of three and fifteen not attending school are defined as being deprived as well (National Council for the Evaluation of Social Development Policy, n.d.). The database includes the completion of primary school throughout rural regions, which is included as one of the variables in the study to show poverty. Further, being literate by the age of fifteen for any age group and gender is the proxy used to define those that have a basic education level.

Having access to health services is vital in a community, as lacking these can risk the physical integrity of individuals and family homesteads. CONEVAL describes in detail different

means of health insurance that keep the costs of health care low, and that health care is considered a basic human right (National Council for the Evaluation of Social Development Policy, n.d.).

Having access, as is briefly mentioned, is not only about affordability, but in physical access based on distance to health care facilities. Areas with fewer than 5,000 people often have fewer and lower quality health care facilities, thus used as a proxy for physical access to health care.

Quality and basic services are another variable necessary, according to CONEVAL to understand poverty. They define a household as needing to have electricity, piped water within the house area, and sufficient drainage connected to a septic tank or public network (National Council for the Evaluation of Social Development Policy, n.d.). Further, for sufficient quality of housing, having more than 2.5 people per room, which includes the kitchen as a room but does not include the hallways defines being overcrowded and it is necessary to have a cement or some type of coated floor instead of a dirt floor (National Council for the Evaluation of Social Development Policy, n.d.).

While the data is complete in including every municipality within the country of Mexico, there is potential to look at every single rural municipality or every single extremely violent municipality. However, this research focuses on rural violence, therefore study specifically includes only rural municipalities in each of the eight states that have mostly rural populations, which are deemed in this study to be "rural states". The municipalities that will be analyzed are those that have populations of less than 15,000 people (Berlanga, Hernández, and Pérez, 2019).

Each of the data points within the dataset used was completely anonymous, thus ensuring the validity of the study. The anonymity of this dataset, which was specifically mentioned to be de-identified after the fact, decreases the error that comes from the social desirability of wanting to

seem better off than they are (McLeod, 2019). Further, when comparing different communities with each other, there may be some levels of error from inconsistencies with how the questions may be presented or from the desire that some households may have to be recorded as being more well off than their actual present state or, contrarily, some may have not wanted to seem as wealthy as they are. Some of the questions that are included within the dataset are related to each other, as different indicators of education and poverty-related factors, which also helps to show internal consistency of the answers to the questions (Price et al., n.d.).

There are potential errors in using census data instead of survey data in a statistical analysis. With census data, there can be many instances in which individuals or entire households are accidentally omitted from the study (Bell & Cohen, n.d.). This may be either because of a missed housing unit within a multi-unit residence, miscalculation of not accounting for part-time residences, or even accounting for those without a home to reside in at all (Bell & Cohen, n.d.). Another type of potential error may be in accounting for someone twice, possibly because they reside multiple locations for part of the time, and thus are duplicated in the data (Bell & Cohen, n.d.). Erroneous enumerations, where a person is categorized in the wrong location, can occur from a lack of understanding of residence rules, thus assigning someone to the incorrect location in a home, or from a geocoding error where the household's address is simply recorded in the wrong geographic location (Bell & Cohen, n.d.). One aspect of the census data that is not precise is the age category, as the population within the data is recorded by age group. This age grouping can capture a lot of the variability that is a part of recording everchanging ages, and is measured as a continuous variable. The gross census error rate is not calculated for 2015 but is considered to be low because of how recent the census took place. Although these errors could also take place with a

survey that sampled a cross section of the population, there would be fewer people recorded, and the opportunity for error will likely be different from those selected at random.

However, there are also benefits to using census data over survey data, and many potential costs that are avoided by using this available census database. Surveys can be difficult to conduct because there needs to be a strong level of confidence in the accuracy that the sampling frame has of accounting for a cross section of the entire population (Parker, 2011). Further, there can be difficulties in applying how the results of the sample can be interpreted and applied to policies that impact sub-groups (Parker, 2011). Census data is often considered to be more costly and take a longer amount of time to administer to the general public (Parker, 2011). Because the government conducts this data collection at the national level, the database is public and available to researchers at no cost, thus that disadvantage is considered null. Thus, for this research specifically, using the available census databases and having the ability to include all of the data points using STATA is the best option for analyzing these municipalities. This survey itself comes out every five years, is taken at the subject's own residence, and has details not only of what the household member says, but also who is present for the interview (in case that may cause bias in their answers), and a place for the census taker to put in a few direct observations about the dwelling that they saw as well as to rate the accuracy that they perceive the subject responded.

This research seeks to understand the relationship between violence, which homicide rates in rural municipalities is used to represent, and wellbeing, for which the percentages of the population making up to two minimum wages, or more is used to measure. INEGI (National Institute of Statistics and Geography) census data encompassed multiple aspects of education, physical household characteristics, income and earnings, and marginalization measurements. The INEGI

census data was taken in each municipality within the country of Mexico starting in 1995 until the most recent year available, 2015. Another INEGI dataset was combined with a CONAPO (National Council of Population) dataset that recorded the number of intentional homicides and population for each municipality within Mexico. In this second dataset from INEGI, they have recorded the number of intentional homicides in each municipality annually since 1990. This intentional homicide rate data has been combined with a separate annual population dataset taken by CONAPO for the purposes of this study. While most studies looking at communities in rural Mexico use INEGI data, one previous study also used the Income and Expenditure Survey of the Population of Mexico from 1956-1977 to understand poverty and inequality in Mexico before the INEGI surveys that encompass nine socioeconomic variables were regularly used (Székely, 2005).

The two datasets were merged using the INEGI municipality codes to align municipalities' demographic and population variables with their corresponding homicide numbers and rates. Through this, all duplicates were removed from the study, and the year and municipality code variables were renamed within STATA to match and be aligned for further use. Once the datasets were merged, the annual intentional homicide rates for all of Mexico were calculated within STATA and added as a newly named variable to be used in the regression analysis. Figure 1 shows the national annual intentional homicide rates in Mexico from 1990 to 2019. From this calculation, the annual intentional homicide rates of each state within the study were calculated in the same way and are shown in comparison to the national annual intentional homicide rate in Figure 2.

The database for the model was set up to keep only data points within the rural states in the year 2015. This year was chosen for the analysis because it is the most recent for which both datasets were available at the time the study took place. Because the study focus is violence in rural

municipalities, the dataset was sorted to only include the eight rural states in Mexico that had less than 15,000 inhabitants. This is based on the definition of rural states and rural municipalities described in Berlanga, Hernández, and Pérez (2019). The next step was to exclude any variables included in the database that were not relevant to the study question. The intentional homicide rate was then calculated to be specific to these rural municipalities that are left within the dataset by dividing the number of intentional homicides by the population rate and multiplying that result by 5,000.

Empirical Model and Results

Multiple socioeconomic variables were constructed from the available data and were used in the empirical model. All the following variables, besides the homicide rate for the municipalities, are all variables that are included in the CONAPO index of marginalization. While the variation for how they measure this variable is shown to have significantly changed over time, there is consistency within those years in how it is measured and the variables within this dataset give a good perspective of what all would impact overall wellbeing and income. While Chambers and Conway (1991) discuss how many measures of well-being cannot be inherently measured, other scholars claim that socioeconomic disparities and inequality are directly related to inequality in the subjective well-being people experience in their studies of China (Lam & Liu, 2014; Wu & Li, 2013). The nine socioeconomic variables mentioned in the model are the same that Mexico's government uses to characterize marginalized localities. Table 2 shows the different means, standard deviations, minimums, and maximums of each of the nine variables used in the model and the CONAPO census's index of marginalization, to give a more complete perspective of the data.

A multiple linear regression was estimated to predict the percentage of the population that earns up to two minimum wage salaries, as a function of multiple socioeconomic variables and the intentional homicide rate, which is shown as the following:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_x X_x \dots + \epsilon$$

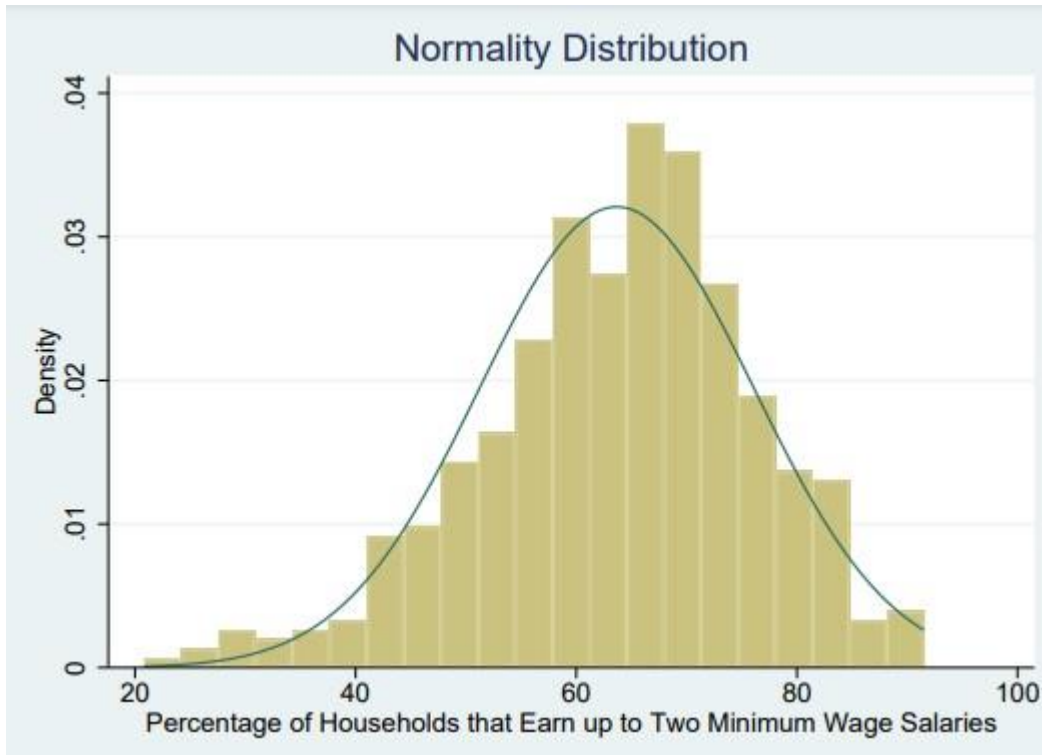
Table 2 shows a basic description of each variable in the regression model.

Table 2 - Descriptive Statistics of the Database (First Regression)

Variable	Obs.	Mean	Std. Dev.	Min	Max
Income of up to 2 minimum wages	455	63.665	12.434	20.8	91.51
Violence	455	1.583	1.885	.084	17.361
Incomplete Primary Education	455	35.991	11.19	6.17	71.24
Education ²	455	1420.323	817.469	38.069	5075.138
Without Drainage or Toilets	455	5.896	9.24	0	70.57
Without Electrical Energy	455	3.334	3.829	0	39.28
Without Piped Water	455	14.997	14.167	0	80.62
With Overcrowding	455	42.782	11.356	16.51	78.46
With a Dirt Floor	455	13.292	10.455	.32	53.53
In Small Towns of less than 5,000 people	455	88.121	17.021	50.06	100

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Figure 3. Dependent Variable Normality Distribution



INEGI Instituto Nacional de Estadística. (2005) major indicators of marginalization and poverty, this study did not find them to be significant (De la Vega, Romo, and González, 2011).

The hypothesis that homicide has a negative impact on income. While all of the different factors that help see the fuller picture of marginalization are not all significant factors in individuals earning up to two minimum wage salaries, homicide is a main contributor in these rural municipalities. The dependent variable, percentage of individuals that earn up to two minimum wages, has the issue of restricting knowing how much individuals in these municipalities actually earn because the percentage of households here are censored at being either at or below two minimum wage salaries (Wooldridge, 2012, p. 610). Most of these variables are percentages, which is constrained within a range from 0% to 100% (Wooldridge 2012, p. 583).

Robust standard errors were also calculated within STATA and analyzed because the dependent variable is measured as a percentage. When checking through the use of standard errors, the results are just shy of being three standard errors from the mean. However, the results indicate normality in a histogram, as is shown in Table 1. The White test was used in Stata to test the regression for the presence of homoskedasticity, and this was followed by the additional use of the Breusch-Pagan test for heteroskedasticity. After running the restricted regression of the interaction between the variables, the null hypothesis of heteroskedasticity was rejected and thus the regression is homoskedastic (Jeffrey M. Wooldridge, 2012, pg. 275). To find if there are any omitted variables, the Ramsey RESET was used to see if there are missing quadratics and if the null hypothesis could be accepted (Jeffrey M. Wooldridge 2012, pg. 301). The test showed that the model had no omitted variables.

Results and Discussion

The first regression results show that homicide, primary school completion rates, household overcrowding, and the presence of dirt floors are all significant at the five percent confidence interval. Lack of electricity and lack of having piped water are variables in the first regression that are significant at the ten percent confidence interval. This means as homicide rates increase by one percent per 5,000 people, the percentage of the population that earns up to two minimum salaries decreases by .767 percent. In other terms, there are approximately $\frac{3}{4}$ a percent change in the population that have vulnerable incomes for every increase in homicide.

While the finding on the impacts of intentional homicide disagrees with previously cited literature on the impacts of homicide to income, this could be from a variety of other reasons such as people

leaving the area or even economic prosperity that may be brought on from drug cartels that could bring more money and business into an area. However, the third regression, which incorporates dummy variables for the impact of the state a municipality is in, shows that intentional homicide becomes insignificant. This may capture the intensity for which rural areas experience similar violent phenomenon to their urban counterparts.

The second regression results show an increase in R by almost .05, while having very small decreases in each of the coefficients of the significant variables other than incompleteness of primary school, which showed a changed coefficient from .545 to 1.584. All the same variables as before were found to be significant, with those being intentional homicide, incompleteness of primary school, living in a dwelling with overcrowding, and living in a dwelling with dirt floors. Education squared, the variable added, was found to be significant at the one percent confidence interval. This found that the impact that education has on the percentage of the population with vulnerable incomes is not a linear relationship, but curvilinear. This means that the closer to almost everyone of working age within a municipality having not completed primary school, the less of an impact education has on a proportion of the population having a vulnerable income.

In the third regression, incomplete primary education, overcrowding, education squared, living in Chiapas, and living in Tabasco are all variables that are significant at the one percent confidence interval. Living in a town with a population of less than 5,000 people is significant with a five percent confidence interval, while living in Hidalgo is significant with a confidence interval of ten percent. There was an increase by more than .07 in R from the second regression to the third regression and showed small changes to the coefficients of the significant variables.

Table 3 - Regression Results

	Income (1)	Income (2)	Income (3)
Violence	-.767*** (.262)	-.773*** (.252)	-.331 (.254)
Incomplete Primary Education	.545*** (.056)	1.584*** (.185)	1.643*** (.209)
Lack of Drainage and Toilets	-.089 (.055)	-.054 (.053)	-.034 (.069)
Lack of Electricity	-.273* (.158)	-.27* (.153)	-.232 (.154)
Lack of Piped Water	.071* (.036)	.058* (.035)	.048 (.034)
Overcrowding	.307*** (.062)	.283*** (.06)	.171*** (.062)
Dirt Floors	-.154** (.069)	-.144** (.067)	-.034 (.066)
Small Town	.041 (.03)	.049* (.029)	.067** (.029)
Education ²		-.015*** (.002)	-.015*** (.003)
Chiapas			11.711*** (2.847)
Veracruz			
Tabasco			17.456*** (3.608)
Hidalgo			5.573* (2.862)
Oaxaca			2.679 (2.798)
Tlaxcala			7.631*** (2.767)
Nayarit			4.002 (4.019)
Guerrero			4.878 (3.093)
_cons	30.896*** (3.154)	14.348*** (4.148)	7.805* (4.479)
Observations	455	455	455
R-squared	.377	.422	.498
<i>Standard errors are in parentheses</i>			
*** <i>p</i> <.01, ** <i>p</i> <.05, * <i>p</i> <.1			

INEGI Instituto Nacional de Estadística. (2019); Minnesota Population Center (2020)

The third regression added dummy variables for location. States can help Eight states were included in this regression, which were Chiapas, Hidalgo, Guerrero, Nayarit, Oaxaca, Tabasco, Tlaxcala, and Veracruz. Veracruz was chosen of the states to be the dropped variable through STATA because it had the highest correlation to all of the other states. Of these eight rural states, Chiapas, Tlaxcala and Tabasco were all found to be significant when compared to Veracruz. Chiapas has a coefficient of 11.711, Tabasco has a coefficient of 17.456, and Tlaxcala has a coefficient of 7.631. Adding in variables to account for the impact of living in different states makes the regression more robust, as it incorporates factors that are controlled at the statelevel such as how much funding goes into local infrastructure, the potential economic opportunities that are present within a state, and the amount of government programs that a state may provide for municipalities to ensure their wellbeing. When location variables are included in the study, violence becomes not significant. This may be because of how location impacts what areas are violent. It may also be that some states have more violence due to other factors capture by this variable.

These states are not very similar to each other. Veracruz is a state with a lot of economic activity (Azuz-Adeath, Rivera-Arriaga, and Alonso-Peinado, 2019), and with the largest population of indigenous people in the nation. While these indigenous people are isolated with poor road quality, there is still adequate access to health care, electricity, and to primary schools (King, 2007). Tlaxcala is the smallest state but also the most densely populated state in all of Mexico (Eakin, 1998), with a lot of young, and rural impoverished people. Chiapas is one of the poorest and most marginalized states in the nation (Rowles et. al., 2018), while being the secondlargest agricultural producing state in Mexico and a significant portion of indigenous people (Schmal,

2019d). The people in Chiapas have little access to safe water, and thus suffer from several health issues as a result (Rowles et. al., 2018; Gutiérrez-Jiménez et al., 2019). Tabasco is a coastal state that faces the Gulf of Mexico and borders Veracruz, Campeche, and Chiapas. Boarding the Gulf of Mexico and having two of the largest bodies of water in the country, this state often experiences flooding that leaves civilians with fewer economic opportunities in rural areas and more vulnerable (Atreya et al., 2017; Avilez-López et al., 2020).

Every regression found that the higher percentage of the population that did not complete primary school there was in a municipality, the more people had vulnerable incomes. As the percentage of the population above the age of 15 that did not complete primary education increases by one percent, the percentage of the population that earns up to minimum salaries increases by 1.643%, in the model that includes all the variables. Education is not only a significant variable, but the changes that it has in income is measurable and the largest impact of all the variables in the study. The results that primary school completion rates have a positive impact on one's income agrees with other studies that find education can play a key role in more opportunities and thus increases in income (de Haro Mota et al., 2017). Education is often a main explanatory factor for inequality, as is discussed in Permanyer and Smits (2019), for developing nations.

Overcrowding was also found to be significant in every regression. However, as more variables were added, the impact became smaller; and for every percent change in how much of the population has overcrowding in their homes there is a 0.171% change in the population that has a vulnerable income. The WHO Housing and Health Guidelines (2018) indicate that household overcrowding can add additional stress to household members, both toward their health and wellbeing. CONEVAL defines overcrowding, as previously stated, as having more than 2.5 people

per room, including bedrooms and the kitchen but not including hallways, and state specifically that overcrowding is an indicator of deprivation. This is consistent with the findings of this study, which show that there is a positive significance effect of household crowding on income.

The final significant variable that is included is the percentage of residents living in localities with fewer than 5,000 people. As it increases by one percent, the percentage of the population that earns up to two minimum salaries increases by 0.067 percent. While some scholars argue that smaller localities have fewer opportunities for employment and thus lower wages, others argue that many agriculturalists and those that have labor-based off-the-farm incomes earn just as much in these areas than in more populated places (Villagómez Ornelas, 2019). Berdegú and Soloaga (2018) discuss that the closer a township is to an urban center, the more rural population growth and welfare a community has. This is because the more remote an area is, the less access to health care, electricity, healthy drinking water, and sewage systems households have (Berdegú and Soloaga, 2018). Any sort of linkages that rural areas cities, event if there are small greatly increase welfare, in contrast to very isolated areas (Berdegú and Soloaga, 2018).

The results showed that many of the other variables, which included the presence of electricity, plumbing, and sewage draining, and type of floor in a dwelling, used in this study were not significant. Some sources previously mentioned found these factors to be significant in the improvement of well-being in Mexico. These may have not been significant because of the definition of well-being used in this study or to other unknown reasons. As CONEVAL previously discussed, access to basic services and quality within a dwelling are important to wellbeing (National Council for the Evaluation of Social Development Policy, n.d.). Having access to safe drinking water, as would be measured through having piped water in a dwelling, for example,

would give better health outcomes to children according to Gutiérrez-Jiménez et. al. (2019). Further, Cattenao et. al. (2007) shows that having cement instead of dirt floors increase the happiness and mental health quality of adults as well as the physical health and education success of children. Therefore, this needs further exploration.

In the final regression, as previously mentioned, violence was not found to be significant, contrary to the literature. Londoño and Guerrero (1999) discuss in their study of multiple types of epidemiological frameworks how violence harms health, while Enamorado et al. (2014) discuss and prove that crime deters economic growth within a region and gives examples of other studies in which crime deters positive investment and opportunities within the community. Bell and Horst (2018) show in their analysis that homicide has significantly negative impacts on state GDP growth as well, which may have poor impacts on state infrastructure and the ability for the states to build opportunities for their residents. Therefore, because adding dummy variables for the different rural states changed the significance of this variable, further studies are needed to understand the relationship between violence, wellbeing, and location.

Martinez-Palomares (2019) discusses how 2015 was an eventful year because Mexico passed and funded more violence prevention programs than the years prior. The correlation he finds between violence prevention programs and delayed increases in violence was significant and may have led to the spike in intentional homicides in the nation in 2016. However, many of the municipalities that would have received this funding would potentially be larger than the municipalities included in this study.

Conclusions

Violence has vast, and often unmeasurable impacts on the wellbeing of civilians throughout Mexico. There have been few studies to determine the impact that violence in rural areas, but as shown in this study, violence is not a phenomenon exclusive to Mexico's urban areas. This was not the case for the rural states of Mexico selected for this study. Instead, this study finds that location/specific states, only having primary education, overcrowding in the household, and being in a municipality with fewer than 5,000 people were significant in explaining low levels of income, while violence did not have an effect.

Limitations to the Study and Variables

One of the limitations of this study is that the census data is not entirely complete for every variable that was included in the dataset for every municipality, even though all the variables used to define poverty in the study were complete. Many of the urban municipalities had more variables included, or even had a different category for how the question was asked, for example. However, the municipalities that fit the parameters that defined a rural municipality in a rural state had complete data for the socioeconomic variables used to determine marginalization. Education completion above the primary school level, for example, is one of the variables that was not available for rural municipalities, except a few, that could inform how education can impact income. Because of this it is not possible to determine the degree to which education impacts the earnings of these community members, nor which level of education beyond primary, leads to higher income. Future government censuses may consider a more comprehensive look at how education impacts the earning of minimum salaries.

Another potential limitation may be what is considered “rural,” since there is no official definition. Not including all rural municipalities, even in more urban or suburban areas, may be a limitation of the study. In urban communities, there were more questions answered that could have been chosen as proxies for these socioeconomic factors measuring wellbeing. For example, questions about each level of education, such as secondary school and college education were included in the study for urban communities, not the case for rural communities. It would be beneficial for future research if the census includes all the questions for every municipality.

Finally, due to the timeframe and resources available it was not possible in this study to correspond the areas of higher homicide rates to other characteristics, such as drug cartel presence, or indigenous people groups. This could increase the understanding of what specific factors may determine what causes violence in specific areas. The findings of this study provide a beginning point to fully understanding the complex issue of rural violence. Calculating and including a dummy variable for the presence of cartels in each place at different points in time may capture the impact fear may have on human and communal development, especially for targeted policies, such as police enforcement. Not having this type of information about what might drive some of these socioeconomic factors that lead to lower levels of wellbeing and income is a limitation of this study.

Discussion and Future Research Implications

In 2011, Mexico passed the Merida Initiative, which is a bilateral strategy and set of goals to meet that helped address many of the socio-economic issues that often spur violence (Ingram 2013). The fourth pillar of the Merida Initiative in particular, focuses on building communal

resiliency; however, there is no specificity given to what defines resilience or lawfulness within communities. Therefore, even while the Merida Initiative does not give specific policy suggestions, it does imply that policies that improve the wellbeing of communities and help them become more resilient to shocks would be a high priority for their state and local governments. Future research could dive into the Merida Initiative to see how the strategy and goals of this strategy could help meet the needs specifically of rural communities and the violence shown there and create policy suggestions to build this communal resiliency.

De Haro Mota et al. (2017) put forward many potential ways in which to reduce inequalities in public development within these highly marginalized municipalities by investing in their housing, schools, and generating jobs that pay well. “Therefore, public policy should include incentives for employers who are willing to offer quality jobs, with social protection, and who demonstrate sustainable productivity increases” (de Haro Mota et al., 2017). They also discuss providing training for those most marginalized to develop skills to fill jobs in most demand, and for the creation of a municipal fund for businesses to withdraw from to start these businesses in their communities (de Haro Mota et al., 2017). De Haro Mota et. al. (2017) also discussed the idea that creating road infrastructure, which is often missing in these communities, will contribute greatly to issues in access to employment, education, and thus induce positive change in the well-being at the individual and communal level while increasing productive activities and supplies of goods.

However, Berlanga et al. (2019) specify that development itself does not often inhibit violence, and that social programs and policies put forth the desire to decrease violence need to focus on violence, and that programs that focus on poverty reduction need to be made with these intentions strictly in mind. Future research that looks into how the creation of social programs and

physical infrastructure such as roads may contribute to the proliferation of violence in rural communities can inform understanding how to serve these communities.

Bel and Horst (2018) found that even as homicide has affected state GDP growth negatively and significantly, investing in fighting drug trafficking through military expenditures at the state level positively impacted per capita economic growth rate. Berlanga et al. (2019) further elaborate the need for rural communities in Mexico to build the capacities of local law enforcement to tackle the rural violence issue, as they are often left out of the greater national security strategies. Counter studies, however, have shown that drug law enforcement often escalates drug-related violence (Espinosa & Rubin, 2015; Osorio, 2015; Rios, 2013; Werb et al., 2011). This was found because, as Rios (2013) explains, either rivaling cartels compete to take control of competitive markets when their competitor becomes vulnerable from the loss of a leader, or in the crossfires as law enforcement arrests traffickers. Because of the different findings of the impacts of heavier law enforcement toward the movement and sale of drugs, understanding how different types of communities are specifically impacted by various levels of law enforcement could help shape policies and the funding and placement of law enforcement efforts. Law enforcement could specifically be placed in areas that are often left out of national security strategies where they could be effective in curbing violence, while being pulled back in areas where increased enforcement may escalate drug-related violence.

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