

A SPATIAL, TEMPORAL AND DETERMINISTIC ANALYSIS OF THE ECONOMICS OF  
CONFLICT IN HAITI

By

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To my parents and my sister

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## LIST OF ABBREVIATIONS

ACLED	Armed Conflict Location and Event Dataset
CD	Convergence Democratique
DHS	Demographic and Health Surveys
EWMA	Exponentially Weighted Moving Average
FL	Fanmi Lavalas
FLRN	Front National pour le Changement et la Democratie
GDP	Gross Domestic Product
GIS	Geographical Information System
HNP	Haiti National Police
LCL's	Lower control limits
LISA	Local indicators of spatial association
MAGIC	Mid-American Geospatial Information Center
MIF	Multinational Interim Force
MINUSTAH	United Nations mission
UCL's	Upper control limits
VIF	Variance Inflation Factor

Abstract of Thesis Presented to the Graduate School  
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This research examines the spatial and temporal patterns of conflict and political violence in Haiti's 133 communes during the time period 1997 to 2010. Using the publicly available Armed Conflict Location and Event Dataset, statistical and geospatial techniques tested for patterns and causal relationships at a disaggregated level.

The temporal analysis of conflict identifies two unique temporal periods of conflict between 1997 and 2010. Haiti experienced a civil war period with elevated levels of political conflict from September 2003 to June 2005. Prior to and after the civil war period, Haiti experienced continuous low-intensity conflict with political conflict remaining part of Haitian living conditions.

The spatial analysis of conflict indicates that political conflict and violence is spatially clustered, and primarily occurs in the urbanized areas of greater metropolitan Port-au-Prince, Gonaïves, Saint-Marc, Cap-Haïtien, and Petit-Goâve. Furthermore, as conflict intensified spatial diffusion of conflict occurred, with conflict intensity rising in the north of Haiti.

Within the studied time period, demographic, political, and military strategic factors primarily impact conflict propensity in Haiti. The determinants of conflict are time

variant and the set of determinants for continuous low-intensity conflict as compared to the determinants of conflict during civil war are dissimilar. The low-intensity continuous conflict has a mass population effect, where conflict is greater in areas with higher population. The determinants of the civil war are demographic, political, and military strategic factors. Contrary to other disaggregated studies of conflict, average wealth levels in a location do not explain conflict propensity in Haiti.

## CHAPTER 1 INTRODUCTION

### **Overview**

Conflict and economic development are interrelated. “The high cost of war in terms of human suffering and socioeconomic decline is well known, and conflict is commonly cited as an important cause of poverty in the countries involved” (United States Agency for International Development 2005). Conflict begets lower levels of economic development, and lower levels of economic development increase the probability of further conflicts and civil wars.

With the end of Cold War era, many experts on international security and conflict expected the level of conflict and civil war in the world to decrease. The Cold War, in the opinion of experts, had propelled conflict and made it feasible to engage in conflict in the world. The United States and the Soviet Union provided arms and financial support enabling for armed conflict and civil war. Hence, most experts believed that with the end of Cold War, and its underlying struggle between communism and capitalism, both countries would be less interested in supporting civil wars and conflict. However, the frequency of conflict and civil war has not necessarily decreased, after the end of the Cold War era. “Contrary to prediction as well as hope, the end of the Cold War and of superpower competition in the developing world witnessed not less armed conflict but new and deadlier forms of civil war” (Arnson and Zartman 2005). The root of conflicts and civil war cannot be easily determined for many of the observed post Cold War era conflicts and civil wars, but the most frequent explanations of conflict are economic, social, political, religious, or institutional in nature.

In 1804, Haiti declared its independence from France, the reigning colonial power in Haiti. Haiti has now been an independent and sovereign nation for over two hundred years. The birth of the Haitian nation was similar to the birth of the United States of America. Nevertheless, the contrast of what unfolded in the last two hundred years, in both nations, could have not been starker. Democracy, prosperity, and stability developed in the United States. Chaos, poverty, and instability developed in Haiti. Mats Lundhal, a renowned Haitian history scholar, states “during the course of the 19<sup>th</sup> century, a “soft”, or predatory, state” (Lundahl 1989) developed. The elite in the country used the state as a tool to gain prosperity and power through it. The state’s primary function was altered from serving the needs of people to providing economic rent to the elite. As the state turned into a predatory state, the control over the state became crucial, since it provided significant economic rent. Between 1843 and 1913, “with few exceptions, sitting governments lasted only for short periods. Coups, insurrections, and civil war took place with amazing frequency – more than a hundred times” (Lundahl 1989).

In 1957 François Duvalier was elected as president of Haiti. Duvalier developed into a despotic dictatorship consolidating all power in the state to himself. “He developed the predatory state into a full-fledged reign of terror, using sheer violence to create respect for his authority” (Lundahl 2008). Duvalier abandoned democratic processes, stifled any opposition him, and led the country into serious economic trouble. In 1971, after the death of François Duvalier, his son Jean-Claude Duvalier took over the office of president. Jean-Claude’s reign was equally brutal and suppressive as his father’s rule, with “Bebe Doc” focusing primarily on maintaining a stronger power base

and suppressing any antagonism. Haiti's history in the second half of the 20<sup>th</sup> century was characterized by brutal dictatorships committing horrendous acts of violence and oppression. Conflict and violence remained part of the Haitian experience in the beginning of the 21<sup>st</sup> century as political instability and tension in the country remained high. Sadly, conflict, violence, and civil war have now long been part of the Haitian identity.

### **Motivation**

There is an emerging literature on the economics of conflict, and the related structural variables causing or correlating with violence, conflict, and civil war. Researchers have investigated the underlying relationships between economic development, the emergence, continuation and cessation of violent conflict, the economic costs and benefits associated with violent conflicts, and policy interventions. Political scientists, geographers, and economists attempt to broaden and deepen our understanding of the causal structures affecting the likelihood of intrastate conflict and violence in society.

The World Bank spearheaded these renewed efforts to understand intrastate and violence in a globalized world, which has significantly been altered after the end of the Cold War. "Civil war is pertinent to the World Bank because it occurs predominantly in low-income countries and, evidently, reduces income even further. Hence, it is of concern for an organization whose mission is poverty reduction" (Collier and Sambanis 2002). A discussion about economic development must encompass a deep understanding of the roots of conflict and civil war, the processes of civil war and conflict, the remedies against conflict and civil war, and possible interventions both prior and post-conflict.

Haiti is the “poorest country in the Western hemisphere with 76 per cent of its population living on less than US\$2 a day” (Heine and Thompson 2011). The level of poverty in Haiti is extreme. The infrastructure, education system, transportation system, and health care are all in disarray. The causes for underdevelopment in Haiti are manifold, and no singular cause of poverty can be established. Haiti’s history is one of political instability, a predatory elite, and outbursts of violence, conflict, and civil war. The fragility of the state and the violent climate of Haiti must be one of the root causes of underdevelopment in Haiti. Hence, an economic development strategy for Haiti should encompass a robust understanding of conflict and civil war in the Haitian society.

### **Problem Statement**

I will examine and attempt to identify the determinants of violence and conflict in Haiti by identifying if and when various demographic, geographic, economic, and institutional factors are associated with different levels of violence. Furthermore, the spatial and temporal structure of violence and conflict will be examined to uncover trends and structures of violence in the context of Haiti.

The research uses the Armed Conflict Location and Event Dataset (ACLED) (Raleigh et al. 2010). The ACLED is designed for disaggregated conflict analysis and crisis mapping. This dataset codes the location of conflict events in 50 countries from 1997 to early 2010. The dataset contains information on the date and location of conflict events, the types of events, and their specifics. The dataset can be used in any spatial analysis or mapping program. The advantage of the ACLED, as compared to any datasets similar to it, is that it allows for a study of conflict and violence at a local level. The country is not seen as a homogenous entity, in which conflict is similarly likely in all locations, but the country is a heterogeneous entity with different risks of conflict and

civil war within its national borders. The ACLED provides disaggregated data for Haiti between 1997 and 2010, which enables a temporal, spatial, and causal examination of conflict and violence in Haiti. To examine the causal structures of violence in Haiti, the ACLED dataset will be linked with localized demographic, institutional, economic, and geographic determinants.

### **Objectives**

This research is guided by the following objectives,

- Examine the temporal structure of the Haiti ACLED data. Assessing the variation in the ACLED data for various time periods.
- Examine the spatial structure of the Haiti ACLED data in order to understand the local, disaggregated context of violence in Haiti.
- Empirically test the relationships between determinants and the occurrence and variance of violence between 1997 and 2010.

Findings to date within the Economics of Conflict literature have identified various relationships and causalities between various determinants and violence and conflict in countries. Our research on violence and conflict in Haiti seeks to identify the particular determinants correlated with violence and conflict in Haiti. The goal is to extend the understanding of the dynamics of violence and conflict, while emphasizing the changing temporal and spatial aspects to violence.

A broader understanding of violence and conflict in Haiti will assist policy makers in their attempts to foster economic development in Haiti. Conflict and violence have historically been high in Haiti, and an understanding of the patterns of violence in Haiti will enable policy makers to preemptively reduce the risk potential for violence and conflict. Since conflict and violence are a determinant of economic development, the

structure of conflict and violence must at least be considered in policy discussion for economic development in Haiti.

## CHAPTER 2 LITERATURE REVIEW

The literature review in this chapter encompasses three distinct parts. The historical context of violence in Haiti focuses in particular on the time period between 1997 and 2010. Violence and conflict occurs within a social, political, and economic context that has emerged over time. Hence, any understanding of causal structure necessitates a deep knowledge of the historical background. The second part of the literature review focuses on the ACLED, which details the intensity of conflict and violence for different time periods and locations. Lastly, a review of the conflict and civil war literature in developing countries is necessary. It provides the theoretical background to the studies of localized violence and conflict.

### **A Brief Overview of Haiti**

Haiti is a island nation located in the Caribbean, being in the “western one-third of the island of Hispaniola” (Central Intelligence Agency 2012) as well as several nearby islands in the archipel (e.g. Gonave, and Tortue); Figure 2-1 shows a map of Haiti. The Dominican Republic lies in the eastern two-thirds of the Hispaniola Island, and the Dominican Republic is the only country Haiti shares a border with. Haiti is a relatively small country; it is slightly smaller than Maryland in size (Central Intelligence Agency 2012). Haiti has a “tropical” climate, and the terrain of Haiti is “mostly rough and mountainous” (Central Intelligence Agency 2012). The lowest elevation level in Haiti is at 0 meters, and the greatest elevation point is 2680 meters. Haiti is also frequently hit by hurricanes and massive storms. In recent years, Haiti has had to suffer through various natural catastrophes, such as hurricanes, earthquakes, and massive flooding. In addition to natural catastrophes, Haiti is also one of the countries with the greatest

deforestation in the world. The geography of Haiti poses significant challenges to the country. Environmental degradation, the rugged terrain, and the overall climate pose significant challenges to the country.

Haiti's population is homogenous, in terms of ethnic and religious fractionalization. 95 percent of Haiti's population is black, while the remaining 5 percent of the population is mulatto and white (Central Intelligence Agency 2012). Frequently, developing countries have various large, separated ethnic groups; however, this is not true for Haiti. Furthermore, there is little religious fractionalization in Haiti. 80 percent of the population is catholic, and 16 percent is protestant (Central Intelligence Agency 2012), though approximately half of the population actively practices voodoo (Central Intelligence Agency 2012).

"Haiti became the first black republic to declare independence in 1804" (Central Intelligence Agency 2012), but the country's democracy did not flourish afterward. Haiti struggled with political instability, and was ruled by various authoritarian regimes. "To understand Haiti's authoritarian and turbulent politics—only 7 of its 44 presidents have served out their terms, and there have been only 2 peaceful transitions of power since the beginning of the republic" (Fattouh 2005). In 1986, Jean-Claude Duvalier, known as Bebe Doc, was ousted as President of Haiti. He had inherited the political power from his father François Duvalier. Both of them were authoritarian rulers, and 1986, at least in part, marked the ending of authoritarian rulers in Haiti. Yet Haiti's political process, since then has not been stable. A turbulent political culture has remained to this day, though Haiti is a democracy that has been led by several democratic elected Presidents, since 1986.

“Haiti, with some 8 million people, is the poorest country in the Western Hemisphere and has been so for quite some time” (Verner 2008). “In 2001, 49 percent of the Haitian households lived in absolute poverty with 20, 56, and 58 percent of the households in metropolitan, urban, and rural areas, respectively, being poor based on a US\$1 a day extreme poverty line” (Verner 2008). Haiti’s extreme poverty is rooted in a vast array of factors (i.e., low education levels, high corruption, lack of natural resources, environmental degradation, frequent natural catastrophes, weak institutions, etc.). There are many reasons for the development of these factors. Haiti is a country with a long history of political instability, governance crisis, weak institutions, and low investment, as will be detailed in the following section.

### **The Historical Context**

“Only seven of its forty-four presidents have served out their terms, and there have been only two peaceful transitions of power since the beginning of the republic”(Shamsie and Thompson 2006). Haiti has been marred over the last two hundred years by political instability, the rule of the wealthy and powerful, and the existence of severe poverty. Political and social power has been acquired in the history of Haiti primarily as an avenue for individuals to gain economic wealth and concentrate social power. Once political power has been acquired, the goal of those in power has been to maintain such power, and the rents received from it. To protect their power, “those holding political power have used any means available to maintain their position of privilege and authority”(Shamsie and Thompson 2006). Political violence towards regime opponents and civilians has been common throughout the history of Haiti.

In 1957 François Duvalier came to power in Haiti. He can be best described as military dictator par excellence, who ideologically framed himself as a black nationalist.

Duvalier challenged the power of the military, which had played a crucial role in the political history of Haiti, “and undermined it by the creation of a paramilitary organization – the macoutes”(Shamsie and Thompson 2006). With the help of the macoutes, Duvalier controlled the country over the next 14 years, and it is estimated that “perhaps 50,000 people were killed”(Hallward 2007). Duvalier reign did nothing to promote either political freedom or economic development.

François Duvalier died in 1971, and his son Jean-Claude Duvalier succeeded him as president. Throughout the 1970s, Jean-Claude Duvalier enacted economic reforms in Haiti, which were backed and supported by the international community, in particular the United States, and a short period of economic development occurred. Additionally, “he stopped the worst excesses of the macoutes, tolerated some dissent, and rehabilitated the army as an institution” (Shamsie and Thompson 2006). In the early 1980s, Jean-Claude Duvalier stopped economic liberalization and Duvalier embraced the use of political violence again.

The brutality of the Duvalier regime prompted the rise of another important political institution that has influenced the history of Haiti ever since. In the early 1980s, “small, informal organizations – organizations populaires” (Hallward 2007) emerged in Haiti. Additionally, the “Ti Legliz (little church)” (Shamsie and Thompson 2006) materialized from the Catholic Church, and vehemently fought for social justice and the rights of all people, opposing the Duvalier rule and the macoutes. Both the organizations populaires and the Ti Legliz “denounced the regime and demanded social justice” (Hallward 2007). In 1985, the wave of protest increased to unknown levels, and in early 1986 protest against the Duvalier regime had become rampant even in Port-au-

Prince. On 7 February 1986, the army forced President Duvalier out of office, and he was eventually exiled in Paris, France.

The military once again “reclaimed its customary spot at the center of Haitian politics” (Girard 2010). It was the military between 1987 and 1991 that was the kingmaker. Without the backing of the military, no political actor became president, or maintained the power to remain president. After Duvalier left Haiti, the power was initially held by the National Government Council, and then in a short amount of time presidents Mangiat, Namphy, Avril, Abraham, and Trouillot were in power. “Despite frequent governmental reshuffles, these years were marked by a societal status quo: the thugs inherited from the Duvalier era were still in charge” (Girard 2010). The military continued the political oppression and violence of the Duvalier era, and living conditions in Haiti did not change for the better.

From the popular movements (i.e., the organization populaires and the Ti Legiz), a new movement emerged, named “the Lavalas” (Girard 2010). Lavalas translated means the flood, and it was a symbolic name for the masses unifying under leadership fighting against the oppression of the military regime. The popular leader of the Lavalas movement was Jean-Bertrand Aristide. Aristide came from humble backgrounds with his mother being a simple merchant in Port-au-Prince. A Catholic priest took Aristide under his wings in his youth, and hence Aristide was able to get a top notch education, gaining his Master and PhD in Europe and the United States in psychology and theology, respectively. In 1982 Aristide returned to Haiti, after his studies were completed, where he eventually became a priest in Port-au-Prince. Aristide had publicly criticized the Duvalier government in the 1980s, and also defended the rights of the

poor and provided for them. His theological and social views were influenced by liberation theology, which believed that Christians must actively work for the economic and social justice of all people. Liberation theology believed in the preferential option for the poor, a notion that society and government must by all means protect the rights of the poor. While the political violence was a consistent force throughout the late 1980s, the Lavalas movement remained alive and continued to oppose the military power in the country.

The army had become “profoundly divided” (Girard 2010) by the late 1980s, and continued domestic opposition in combination with international pressure forced a presidential election on December 16, 1990. The hope was that the election would finally bring stability to Haiti and its political system. There were multiple candidates running in this election: Marc Bazin was a former World Bank economist, Victor Benoit was supported by left-leaning political parties, Roger Lafontant was a former minister of the interior under the younger Duvalier, and Jean-Bertrand Aristide was the favorite of the masses and leader of the Lavalas movement. On the actual day of the election, it was clear to everyone in Haiti that Aristide would win the election, as long the election result would be determined in a fair manner. Aristide was remarkably different from the typical Haitian political candidates: Aristide was not a member of the mulattoos elite, from which the vast majority of Haitian leaders had come from previously, but aspired to be the leader of the masses defending their rights. In 1990, the popular opinion about Aristide was that he truly protected the rights of the poor, and was in that sense different from all other politicians in Haiti. On Election Day, Aristide won the election by a significant margin winning 67 percent of all votes. Aristide’s victory “revealed the power

of the numerous grassroots 'popular' organizations that had developed in Haiti”(Hallward 2007).

The political and economic reforms of the first few months were certainly not as radical as one could have expected, due to the radicalism of his rhetoric before the election. Aristide worked on “balancing the budget and trimming the bureaucracy” (Hallward 2007), “enforced the collection of import fees, and increased tax revenues from the rich” (Hallward 2007). Even though Aristide did not oppose the military and its power directly, he still removed officers from their positions, and “replaced the army’s hated section chiefs with elected officials and an apolitical police” (Hallward 2007). Aristide also began implementing various social programs combating the poverty and destitute situation in Haiti.

In September 1991, Aristide flew to New York to deliver a speech at the United Nations. Once he landed in Haiti after the trip, he was informed that a coup had begun. Eventually Aristide was forced into exile. The new man in power was Raoul Cedras, a military leader. The reign of Cedras was marked by political oppression and misery. Cedras suppressed in particular the poor, who had supported Aristide. “The Army imposed a reign of terror that claimed about 3,000 victims in three years” (Girard 2010). The military harshly suppressed the grassroots movements, which had been so crucial to Aristide’s success. “The army had learned the single most valuable tactical lesson in its long campaign against Lavalas. In order to contain the popular mobilization, you must seal off and then terrorize the slums where its most determined partisans live” (Hallward 2007). To extenuate the plight of Haitians, the country’s economic fortunes also diminished during this time. The international community imposed a trade embargo

on Haiti, and foreign aid decreased significantly as well. As a result of the dire situation in Haiti and the general disenfranchisement of the Haitian population, more and more Haitians attempted to flee towards the United States using boats or other small vessels.

Once Bill Clinton became the President of the United States in 1993, the politics of the United States towards Haiti changed; the previous administration had opposed the socialism of the Lavalas movement. Clinton was concerned about the humanitarian situation in Haiti and the rising stream of Haitian illegal immigrants to the United States. Over the next two years, multiple UN resolutions were decided upon, and the United States as parts of an international coalition were preparing to invade Haiti. In the end, however, an agreement was negotiated that allowed Aristide to return to Haiti to finish his presidential term, and a UN peace keeping force under the leadership of the United States entered Haiti. The eventual agreement between Aristide and the military government of Cedras, which enabled Aristide's return to Haiti, was a controversial agreement. Aristide made "many compromises in order to return to power" (Hallward 2007), including the adoption of a neo-liberal economic policy due to the pressure of the United States, and he "came back in 1994 less controversial and more diplomatic" (Hallward 2007) in his leadership approach. Chavannes Jean-Baptiste "spoke for many of Aristide's 1990 fellow-travelers when he said in 2005 that Aristide completely changed in the US. He had become unrecognizable, a monster, obsessed with money and power" (Hallward 2007). Such a statement is extreme, but also indicates that the Aristide of post-1994 had changed his positions and approach.

Aristide's return to Haiti was celebrated emphatically by Haitians, and the old, new president had never been more popular than at his return. "One of Aristide's

initiatives had been to disband the army on 31 December 1995” (Shamsie and Thompson 2006). The army in Haiti had intervened in the political arena frequently ousting scores of presidents in the History of Haiti, just as it had been instrumental in removing Aristide in 1991. By abolishing the military, Aristide’s could be ensured that a coup d’état would be unlikely. Secondly, a new parliament was to be elected, and after several delays, a parliament was in place in October 1995. In the fall of 1995, Aristide began to rhetorically attack the presence of the United Nation mission in Haiti, and in particular the fact that United States military was stationed in Haiti. He focused more on maintaining and stabilizing his power basis and criticizing foreign powers, rather than on fighting the “urgent problems such as hunger, law and order, judicial reform, and AIDS” (Girard 2010). Amnesty International “contended, and with good reason, that a general willingness to tolerate a culture of impunity would lead to problems in the future” (Shamsie and Thompson 2006); in particular, “little effort was expended to bring perpetrators of past abuses to justice, while political violence and political abuses were common” (Shamsie and Thompson 2006).

In 1996, Haiti experienced a peaceful transition of the presidential power. Aristide had finished out his presidential term, and the constitution prohibited him from running for a second term. The popular masses were still extremely supportive towards Aristide, and it was clear to people in Haiti that Aristide would be quasi appointing the new president, which would run under Aristide’s party, the Lavalas party. Aristide decided on Rene Préval, a Haitian who had been educated in Belgium and the United States, was a trained agronomist, and who had known Aristide since the early 1980s when the two of them had “run the Lafami Selavi shelters” (Girard 2010), an organization with a mission

of assisting the poor. Préval had also served as Aristide prime minister in 1991 and was one of the confidants of Aristide.

Préval was an “accomplished administrator and conciliator” (Hallward 2007), while also not being directly part of a political party or association. Once in office, Préval “tried to steer a middle course between the Aristide loyalists and an increasingly anti-Aristide Organisation Politique Lavalas” (Hallward 2007). Préval’s prime minister was Rosny Smarth, from the Organisation Politique Lavalas. Smarth was a proponent of structural, economic reforms, and “IMF-style privatization” (Hallward 2007), whereas Aristide was a left-ward progressive with socialist preferences. In 1996, Aristide created a new political party, Fanmi Lavalas (FL). “Fanmi Lavalas was designed to re-establish direct links between local branches of the Lavalas mobilization and its parliamentary representation” (Hallward 2007). The Fanmi Lavalas won “legislative elections that took place in 1997” (Hallward 2007), and the Organisation Politique Lavalas lost many seats in parliament. The Organisation Politique Lavalas “refused to accept” (Hallward 2007) the election results, and “blocked the second round” (Hallward 2007) of elections needed to finish the election process. From this point on, the legislative process came to dead halt with the Organisation Politique Lavalas blocking most of the legislative actions in Haiti.

In 1999, the legislative terms of the parliament had ended, and “the arrangement of another set of elections” (Hallward 2007) was delayed until May 2000. In this time, Préval governed the country by presidential decree with no functioning parliament in place. In May 2000, elections were planned and held in Haiti. “Aristide’s party also won an overwhelming majority of the seats in both houses of parliament in 2000, thereby

making it possible for him to govern without significant legislative opposition” (Dupuy 2006). In November 2000, a presidential election took place, and Aristide handedly won the election. After this election the political appointees of Aristide were surprising to many of his supporters and generally not supported by them. He included, for one, Marc Bazin, a former World Bank economist, and Stanley Theard, a minister under Bebe Doc, who allegedly was involved in a major corruption scandal.

Right after the presidential election in 2000, a democratic opposition formed. Many of losers of the 2000 election regrouped as the Convergence Democratique (CD). The group primarily refused to accept “the legality” (Shamsie and Thompson 2006) of the 2000 elections. The Convergence Democratique was supported by the United States, and in particular the Bush administration. The Bush administration “opposed Aristide for ideological reasons and starved his regime of badly needed foreign assistance” (Shamsie and Thompson 2006), while simultaneously supporting the Convergence Democractique.

The security situation in Haiti around 2000 was a complex situation with various agents and actors involved. The Haiti National Police (HNP) was founded in 1995 to bring safety and security under civilian control, and the HNP replaced the military, becoming the only and dominant security in Haiti. The presence of the HNP was particularly great in Port-au-Prince and much less so in the rural areas of Haiti. It is important to note the following two details about the HNP: for one, part of the HNP was recruited from the abolished military, indicating that at least part of the HNP was not supportive of the Aristide rule, and secondly the HNP was marred by corruption and cronyism.

In addition to the HNP, “armed groups operated in the slums of Port-au-Prince, Gonaives, and other destitute cities” (Hallward 2007). These armed groups were frequently criminal groups focused on controlling certain areas of major cities, and gaining money and wealth from illicit activities. The gangs varied in strength and purpose. In general the armed gangs, called Chimères , were “loyal to Aristide” (Hallward 2007), though it is unclear and disputed how closely aligned the Chimères were to Aristide and how much of their criminal activity was supported by Aristide. Alex Dupuy, a researcher and professor, stated the following opinion:

The Chimères did Aristide's and the government's dirty work and, along with the police, attacked and killed members of the opposition, violently disrupted their demonstrations, burned their residences and headquarters, intimidated members of the media critical of the government, and engaged in countless other human and civil rights violations. Some leaders among them also became a force in their own right by forming criminal gangs that acted autonomously, turned their neighborhoods into wards under their control, engaged in drug trafficking and other criminal activities, and even requisitioned the government itself. (Dupuy 2006)

To what extent this opinion is true cannot be conclusively determined, but the Chimères had a crucial part in the security situation in Haiti throughout the Préval and Aristide presidencies.

“The mid to late 1990s saw a gradual and arguably premature reduction in the UN/OAS presence in Haiti” (Shamsie and Thompson 2006). The focus of the mission was to train the new HNP. The force was comprised of military personnel of various countries. The actual size of the United Nations mission prohibited it to pacify and control the entire country, even if it might have been necessary.

When Aristide abolished the army he had “created a large pool of eligible and resentful ex-military labor” (Hallward 2007). These former army soldiers were well trained; most of them had been trained by the United States. These former army

soldiers represented a threat to the security situation in Haiti, as many, especially former officers, were politicized and the abolishment of the army in 1995 increased their economic uncertainty. In the following years, former military members played a crucial role in the history of Haiti.

There are several interpretations of what transpired between 2000 and 2004 in Haiti, and in particular the role of President Aristide and Fanmi Lavalas had throughout it. There are basically two camps and interpretations about President Aristide and his legislation during this time period. Former Lavalas and Aristide supporters “like Jane Regan, Charles Arthur, Alex Dupuy and Christopher Wargny” (Hallward 2007) have been highly critical of President Aristide and his legislation. A former supporter of President Aristide, Michele Montas stated:

those ideals shared by Jean, including a generous but rigorous socialism, respect for liberties within the framework of democracy, nationalist independence, based on a long history of resistance, those ideals that Jean used to call "Lavalas" are trampled every day in this balkanized State where weapons make right, and where hunger for power and money takes precedence over the general welfare, causing havoc on a party which, paradoxically, controls all the institutional levers of the country. (Dominique 2002)

The critics of Aristide argue that Haiti, in the period between 2000 and 2004 had become more and more violent. These critics blame President Aristide for the increased violence, arguing that he encouraged and tolerated violent gangs and their throughout this time. Journalist Michael Deibert argues “that the arming and deployment of murderous pro-Lavalas gangs was deliberate government policy, that it was coordinated by local PNH boss Hermione Leonard and veteran Aristide loyalist Jean-Claude Jean-Baptiste along with others in the presidential security team” (Hallward 2007). According to critics, the Chimères had been purposefully used, and were intended to be a

counterweight to the opponents of Aristide, whether it was the democratic opposition or former military personal. Aristide accepted the use of force and violence to protect his own power, and he himself had become a despot more fixated on maintaining his power than promoting development or social justice.

In contrast to the critics of President Aristide and his regime, we can find people like Noam Chomsky, Dr. Paul Farmer, and some “committed local activities – G rard Jean-Juste, John Joseph Jorel, Jean-Charlie Mo se, Belizaire Printemps, Samba Boukman, Real Dol” (Hallward 2007) who support a different view of the failure of the Aristide presidency. With its eventual overturn in 2004, these supporters interpret events as a successful act of sabotage, which removed a democratically elected government from office.

Both internal and external actors had been discontent with the rule of President Aristide. The internal actors were the rich elite of Haiti, which had been marginalized by the Lavalas movement, the former military leadership who had lost all of their power, and the Group 184, the democratic opposition to President Aristide. Additionally, it has been argued that the United States opposed President Aristide, while simultaneously supporting the Group 184. Former US ambassador to El Salvador Robert White said about Roger Noriega, Bush Assistant Secretary of State for Western Affairs, in February 2004, “Roger Noriega has been dedicated to ousting Aristide for many, many years, and now he’s in a singularly power position to accomplish it” (Hallward 2007). Aristide was seen as a violent socialist and populist destabilizing both Haiti and the Caribbean region. Supporters of Aristide argued that US opposition to Aristide was founded on Aristide’s identity as a left-leaning populist. The internal actors were opposed to Aristide,

due to them losing, for the first time really in Haiti's history, significant political and economic power. Aristide's populist approach was hurting their status as the elite in Haiti. Hence, Aristide, according to his supporters, was brought down because of the internal and external resistance of powerful actors in Haiti.

The proponents of Aristide argued that "a certain amount of corruption in parts of the rapidly expanding Lavalas hierarchy" (Hallward 2007) existed, whereas opponents of Aristide argued that he, in particular, had been a corrupt dictator along with his entire regime. Corruption and cronyism was a striking aspect of Haiti from 2000 and 2004, but how corrupt Aristide himself was has been a point of contention.

The human rights condition was fragile in this time period. The supporters of Aristide argue that human rights violations, by the regime or regime supporters have been grossly overestimated and the human rights situation was not as tenuous as described by opponents of Aristide.

Of course under Aristide there was gang violence in places like Citè Soleil and Raboteau, as there was before Aristide and after Aristide. But if reports from Amnesty International can be trusted -....- then from 2001 to 2004 perhaps thirty political killings can be attributed to the PNH. (Hallward 2007)

In 2004 Brian Concannon argued that human rights violations were "neither quantitatively nor qualitatively comparable to those of the dictatorship" (Hallward 2007). The proponents of Aristide argue that he and his administration did not approve of corruption, and political violence, at least initiated by the administration, was nonexistent. However, the Group 184 and the United States used exactly these reasons to remove Aristide from office in 2004 proving that not facts were the reason for removing Aristide, but much more the opposition for what Aristide stood for, namely a populist and socialist approach advocating for social change.

The evaluation of Aristide's reign remains uncertain, and a definitive judgment must be withheld. Yet, it is possible and necessary to outline the events that ultimately led to the ousting of Aristide in 2004 in order to provide an adequate backdrop for the analysis conducted later in this thesis.

In February 2001, the inauguration of President Aristide took place. Aristide had named Jean-Marie Chèrestal as his prime minister, who had previously worked in Aristide's first administration. The CD established a parallel government, and "installed ex-human rights lawyer Gèrard Gourgue as Haiti's parallel president" (Hallward 2007). The CD wanted to establish a political alternative to the Lavalas movement, and consistently disputed the validity of 2000 election results.

"In February 2001, Haiti's government was already verging on bankruptcy" (Hallward 2007), and the fiscal and economic situation of the Haitian government was severely compromised. Aristide's economic policy was to apply "a populist agenda of higher minimum wages, school construction, literacy programs, higher taxes on the rich and other policies" (Hallward 2007). The Haitian economy suffered in particular during this time from the receding international donor support, which limited the amount and extent of public programs.

In July 2001, armed conflict was initiated by former army members, part of the Front National pour le Changement et la Democratie (FLRN), which was an anti-Aristide rebel group led by Jodel Chamblain and Guy Phillippe. The rebel group attacked multiple targets throughout Haiti. At the end of 2001, another major attack was staged by the FLRN. The FLRN attacked the "presidential palace" (Hallward 2007), and seized the

palace for several hours, before eventually failing in their effort to topple Aristide at this point.

The political situation remained tenuous as well. The government and the CD had serious negotiations throughout 2001. The goal of the talks was to resolve the dispute about the election of 2000, but eventually the CD broke off all talks. Until 2004, no talks between the government and the CD to resolve their issues were ever successful, thus destabilizing the political situation during this time period.

In 2002, Jean-Marie Cherestal resigned from office. He had been “bogged down in debilitating parliamentary squabbles with other ambitious members of FL like Prince Pierre Sonson or Fourel Celestin” (Hallward 2007). The internal dispute in the Lavalas movement had a destabilizing impact upon Haiti throughout the second presidency of Aristide.

In December 2002 another crucial opposition group was formed at a meeting in Santa Domingo, Dominican Republic. “Some 50 businessmen and CD members” (Hallward 2007) met for a three-day period discussing various strategies of opposing President Aristide and his regime. The “G184 was designed to coordinate the cultural and political opposition to Aristide in a single mechanism” (Hallward 2007), and to eventually remove President Aristide from office. The G184 did indeed receive “USAID” (Hallward 2007) funds signaling the support of these opposition by the United States and its Western allies.

While the security situation was bad throughout the reign of President Aristide, “the situation was particularly bad from 2003 and up to the resignation” (Faubert 2006). In 2003, a significant spike in violence occurred, and tension between rebel groups,

Chimères, the government, and HNP rose. The economy also performed poorly with “a negative growth rate of -3.4 percent while the annual growth rate of the population was some 2 percent” (Faubert 2006).

From the time they began in the summer of 2001 through to the middle of 2003, direct paramilitary attacks Aristide’s government remained mere hit-and-run affairs. Then in the autumn of 2003, FLRN attacks become more regular and intense, spreading from the Central Plateau to Petit-Göave and Cap-Haïtien. (Hallward 2007)

In the fall of 2003, the G184 attempted to gain “influence in Citë Soleil and the rest of the poorer neighborhoods of Port-au-Prince” (Hallward 2007) by aligning themselves with Chimères gangs in the poorer areas of the capital. However, the dominance of the Lavalas gangs was too strong and too loyal to President Aristide for the G184 to gain control of these poorer neighborhoods.

In Gonaïves, the Cannibal Army, a gang, “had become a powerful political and economic force in the city” (Hallward 2007). On September 2003, Cubain Mëtayer the leader of the Cannibal Army was murdered, being shot multiple times. The brother of Cubain Mëtayer, Buteur Mëtayer emerged as one of the new leaders of the Cannibal Army then, and he claimed that President Aristide had ordered the shooting of his brother. “The government itself categorically denied any involvement” (Hallward 2007) in the murder though, and claimed the murder was carried out “to undermine Aristide” (Hallward 2007), by attempting to weaken his position in Gonaïves. The Cannibal Army turned against the government, now joining the FLRN in their opposition. Violence increased now significantly throughout the country, and the Cannibal Army and FLRN assaulted important buildings in Gonaïves over the next couple of months. “In Gonaïves and throughout the surrounding area, attacks on police stations by Fanmi Lavalas

activist became routine events” (Hallward 2007) with the government and allied gangs fighting back.

On February 7, after a sustained struggle for control, the Cannibal Army and former Haitian army members gained complete control over Gonaïves. “The rebels went on to take Hinche on 16 February and Cap-Haïtien on 22 February. By 27 February they appeared to control most of the northern half of the country, and parts of the south and south-west as well” (Hallward 2007).

The international community, i.e. United States and France in this case, were not willing to intervene in Haiti to protect Aristide. “Refusing to authorize a peacekeeping force to enter Haiti to stop the rebels and protect Aristide, therefore, was a logical conclusion to a decision taken earlier by the three governments to remove him from power” (Dupuy 2006). The international community did not remove Aristide, but it did allow a rebel force to oust a democratically elected president from Haiti.

On February 29th 2004, Aristide was ousted as the President of Haiti, due to the severe military pressure of the opponents and international pressure. “Immediately after Aristide's departure, the United Nations authorized the deployment of a Multinational Interim Force (MIF) comprised of troops from the United States, France, Canada, and Chile” (Dupuy 2006). The international community had not been willing to protect former president Aristide, but was willing to intervene now. The new president, who was backed by the international community, was Gerard Latortue. The Multinational Interim Force (MIF), a UN peace keeping force also named MINUSTAH, came to Haiti to improve the security in Haiti. The new president, who was backed by the international community, was Gerard Latortue. Latortue headed a government comprised of

members from the CD and the G 184. The purpose of the Latortue government was to pacify the country by “by disarming both armed supporters of the deposed president and the rebel forces of the defunct military and the FRAPH” (Dupuy 2006), which was a paramilitary affiliated with the military. The government instead persecuted and killed supporters of the former President Aristide.

Both the insurgents from the disbanded Haitian army, who precipitated Aristide’s fall, and the brutal Chimères supporting him, have kept their weapons. Under the MINUSTAH-Latortue regime the country and especially Port-au-Prince, endured a climate of insecurity. Gang violence, kidnappings, and political harassment and killings of Aristide’s partisans became widespread. (Shamsie and Thompson 2006)

The support for Aristide remained high, even after the ousting in February 2004, and it remained particularly strong in Citē Soleil, a poorer neighborhood in Port-au-Prince. The Fanmi Lavalas movement was still existent and had popular support throughout Haiti; it just experienced significant backlash.

In late 2004, political violence spiked in the capital, in particular in the neighborhoods of Citē Soleil and Bel Air. The violence occurred between the HNP and the MINUSTAH on one side, and the Chimères gangs of the Port-au-Prince neighborhoods on the other side. Additionally, violence also occurred in other poorer areas of Port-au-Prince. The human casualties in Port-au-Prince were extremely high throughout this time.

In 2004, Haiti suffered from numerous natural catastrophes and tropical storms hitting Haiti, the usual high levels of corruption in government circles, and the extremely high levels of violence and social unrest throughout the country. The situation was so dire that the United Nations mission (MINUSTAH) focused almost exclusively maintaining order in downtown Port-au-Prince, and doing little throughout the country.

In early 2005 the United Nations and the United States were convinced that a certain level of progress in regards to stabilizing Haiti had been achieved. Yet, “the summer of 2005 was absolute hell in every way” remembers Father Rick Freshette.

All of the seams were coming apart, and there was no control anywhere. By the end of 2005, some parts of the country had been pushed to the brink of open rebellion. In January 2006, the New York Times described Latortue’s Port-au-Prince as virtually paralyzed by kidnappings, spreading panic among rich and poor alike (Hallward 2007).

The instability in Haiti “coupled with the weak and incompetent electoral commission, led to four postponements of general elections which were finally held on 7 February 2006” (Shamsie and Thompson 2006). The presidential election hoisted a broad field of candidates coming from various political factions, i.e. G184, the CD, and former army leaders that had supported the overthrow of Aristide in 2004. Marc Bazin a former World Bank economist ran as well, in addition to an evangelical candidate. Rene Prèval, who was ideologically part of the Lavalas movement, entered the presidential race fairly late in 2005.

In spite of major logistical problems and reports of fraud ,Rene Prèval was elected president with an overwhelming majority. Receiving more than 51% of the vote in a field of 33 candidates, Prèval distanced his closed rival by 40 points. (Shamsie and Thompson 2006)

Rene Prèval appointed Jacques-Edouard Alexis as his prime minister.

In September 2006, the UN mission launched a program attempting to reduce violence and conflict by disarming gang members. The initial strategy by the UN was to reduce gang violence through “socio-economic terms” (Hallward 2007) offering financial incentives to give up guns. In January 2007, the UN launched a new offensive against gangs throughout Port-au-Prince. Over the next months, the UN carried out multiple raids attempting to decrease the number of arms in the hands of gangs reducing their

potential for violence. Overall, the level of violence decreased in 2007 throughout Haiti. Several gangs “began making moves toward cooperation with the government’s disarmament commission” (Hallward 2007) in mid-2007.

Throughout 2008, world food prices had risen. In April, riots throughout Haiti rose up protesting the high food prices. The government responded by subsidizing the price of rice to halt the serious unrests. The UN also approved additional food aid to improve food security in Haiti. Prime Minister Jacques-Edouard Alexis resigned and is replaced by Michele Pierre-Louis. In August 2008 a severe tropical storm hit Haiti, killing around 800 people. In April 2009, Haiti held a senate election. The election was very controversial, since a election commission, whose members were appointed by President Préval, excluded the Fanmi Lavalas party. Voters responded by protesting the election, and only 10 percent of eligible voters turned out in this election.

In January 2010, Haiti was hit by a particularly devastating earthquake in Port-au-Prince and its surrounding region. The earthquake is estimated to have killed around 300,000 people (i.e., 3 percent of the country’s population). The international community responded by increasing aid to Haiti. The rebuilding effort in Haiti has been rather slow since. At the end of 2010, a presidential election was held in Haiti, which was controversial again with multiple candidates being held out from election. Fanmi Lavalas candidates were not allowed to run again. In March, 2011 Michel Martelly won the runoff election for the Haitian presidency. Martelly had previously stated that he was an ally or sympathizer of former President Latortue, and had opposed and been critical of former President Aristide.

Haiti's recent historical past has been characterized by political instability, and periods of high political conflict and violence. In the 1980s the Lavalas movement, a socialist, grassroots movement, formed in Haiti. The goals of the Lavalas movement were socialistic and pro poor being opposed to the goals of the business and political elite, who traditionally held economic and social power in Haiti. The clash between the ruling elite and the Lavalas movement was the defining aspect to political and social life in Haiti, since the late-1980s.

### **Armed Conflict Location and Event Dataset**

The ACLED records conflict in various developing countries, including Haiti. A recorded event includes both temporal and spatial information. "ACLED is a conflict dataset that collects reported information on internal political conflict disaggregated by date, location, and actor" (Raleigh et al. 2010). The ACLED dataset records the political violence inside of a particular country, and allows for a disaggregated approach to study patterns of political violence in a country. ACLED focuses on: "tracking rebel, militia and government activity over time and space", "locating rebel group bases, headquarters, strongholds and presence", "distinguishing between territorial transfers of military control from governments to rebel groups and vice versa", "recording violent acts between militias", "collecting information on rioting and protesting", and "non-violent events that are crucial to the dynamics of political violence (e.g. rallies, recruitment drives, peace talks, high-level arrests)" (Raleigh, Linke, and Dowd 2012).

The ACLED records political violence, and labels every single outbreak of political violence as an event. For every event, the dataset includes further information, such as location or time. Understanding all of the included information in the dataset helps researchers have a better comprehension of the dataset.

The ACLED dataset includes the “time information” (Raleigh, 2012) for every event, and it is labeled as event date in the datasets. It records the time, month, and year, when the event occurred. As long as violent activities continue, the ACLED dataset records an event for every single day. “if a military campaign in an area starts on March 1st, 1999 and lasts until March 5th, 1999 with violent activity reported on each day, is coded as five different events in ACLED with a different date for each entry” (Raleigh, 2012). Additionally, the dataset also provides information about the precision of the time information. The “time precision” records this information. If “time precision” is labeled as 1, then data sources provide an accurate, precise date of the violent. If “time precision” is labeled as 2, then data sources provided only the specific week of when the event occurred. If “time precision” is labeled as 3, then data sources provided only the month of when the event occurred and the midpoint is chosen in this case.

The ACLED dataset also separates the event into eight types of events, in other words the ACLED dataset recognizes eight various types of events. “ACLED currently codes for eight types of events, both violent and non- violent, that may occur during a civil war, instability or state failure” (Raleigh, 2012). The “battle–no change of territory” event type characterizes an event, where two factions or groups, such as the government or rebels, had a violent conflict or confrontation, but the “control of the contested area does not change” (Raleigh, 2012). The “battle–rebels control location” event type characterizes an event, where “a battle where a rebel group wins control over a location” (Raleigh, 2012) or area. The “battle–government regains control” event type characterizes “a battle in which the government regains control of a location” (Raleigh, 2012). The “headquarters or base establishment” event type characterizes an

event, when a rebel groups establishes a new headquarter or base camp. The “non-violent conflict” event type characterizes events, in which a “rebel groups / militia / governments participate that does not involve active fighting but is within the context of the war/dispute. For example recruitment drives incursions or rallies” (Raleigh, 2012). For these events, the note section of the dataset gives further clarification of the type of activity that actually occurred. The “rioting / protesting” event type characterizes an event in which a group protests against the government or one of the government institutions. Rioting and protesting is included, since it marks a non violent form of protest against the rules and institutions of a country. The “violence against civilians” event type characterizes an event, in which a rebel group, the government, or a militia engages in a violent activity towards a civilian group. The “non-violent transfer of location” event type characterizes an event by which the possession of a location is transferred between two actors without the use of violence.

The ACLED dataset also includes the actors or participants in the recorded events. The conflict actors are primarily rebel groups, the government, militia, active political groups, or civilians in various countries. All of these groups struggle or fight over political control inside a country. Hence, the ACLED dataset gives information about who was in a conflict with each other.

Governments are “defined as internationally recognized regimes in assumed control of a state” (Raleigh, 2012). Furthermore, changes in the government control can also be understood, and recognized from the ACLED dataset. In the case of Haiti, the control of the government changed throughout the dataset. The police, as being the military arm of the government in Haiti, is labeled in various ways throughout the

dataset (e.g. Police Forces of Haiti (2000 – 2004), Police Forces of Haiti (2004 – 2006), Police Forces of Haiti (2006 - )). The labeling allows for a better understanding of how the control over various institutional forces changes, and extenuates that institutional forces are temporally not uniform in form or function.

Rebel groups are movements with the explicit goal to gain political or territorial control using violence and force as a means to accomplish the goal. “Rebel groups often have predecessors and successors due to diverging goals within their membership. ACLED tracks these evolutions” (Raleigh, 2012).

Militias are paramilitary groups created by the government, military, or rebel group to work in conjunction with them, helping to accomplish their overall political and military goals. Militias are often created for a specific purpose at a specific time. Overall though, the definition of a militia must be understood in the local context. “Militias are recorded by their stated name. In some cases, an ‘unidentified armed group’ perpetrates political violence; the default assumption in ACLED is that such groups can be considered militias and their activity coded under ‘unidentified armed group’” (Raleigh, 2012). “Riots are violent, spontaneous grouping populated by ‘rioters’. These activities are coded as riots if the spontaneous civilian actors become violent against people or property” (Raleigh, 2012). On the other hand “protesters” are non-violent uprisings by groups of people.

The ACLED dataset provides information about the location of the recorded event. It is a geo-referenced data set providing the longitude and latitude of where the conflict event occurred. Additionally, it also provides the name of the country, administrative unit, and city. The dataset informs the user of the spatial precision of an

event. If “geoprecision” is labeled as 1, “the source notes a particular town, and coordinates are available for that town” (Raleigh, 2012). If “geoprecision” is labeled as 2, “the source material notes that activity took place in a small part of a region, and notes a general area, a town with georeferenced coordinates to represent that area is chosen and the geoprecision code will note ‘2’ for ‘part of region’” (Raleigh, 2012).

The dataset provides information about the number of fatalities in any event. The source data frequently provides information about casualties for the different event types. These casualty numbers are included, even though “reported fatality totals are often erroneous, as the numbers tend to be biased upward” (Raleigh, 2012). Furthermore, the data set also provides *eventnotes* for every event. These notes provide explanation about the event, and assist the researcher in understanding the details of the event better.

The ACLED uses press reports as the source of information about events in the dataset. The reliability of sources, such as the government, and/or non-governmental organizations, has frequently been questioned. These actors can have a vested interest to report incorrect numbers, either overestimating or underestimating the amount of violence and conflict in a country. “In the absence of reliable and unbiased sources in most African countries, press reports can serve to evaluate” (Bocquier and Maupeu 2005) levels of conflict and violence. Bocquier and Maupeu tested the reliability of newspapers to accurately measure levels of conflict in Kenya. The authors try to determine the ability of newspaper source to accurately record trends in violent events and conflict. They conclude:

We believe that, if properly analyzed, press reports can certainly serve as a surveillance system of violence, especially when it is collective. Press

reports help measuring the trend of collective violence over time and/or at a sub-national level. The method is particularly appropriate to analyze low intensity conflicts, which persist over decades and are typical of violent political cultures. (Bocquier and Maupeu 2005)

Bocquier and Maupeu defend the use of newspaper sources to analyze and measure conflict in a society, even if such sources include measurement errors and inaccuracies.

Using newspaper sources, the ACLED measures and records conflict events in Haiti. It includes temporal and spatial information, which allow for a temporal and spatial analysis of conflict in Haiti.

### **Country-level Studies of Violence, Conflict, and Civil War**

Civil war and conflict have historically been studied in country-level studies. The outbreak or continuation of civil war and conflict serves as the dependent variable upon which various correlates are tested. The premise of these studies is the identification of robust correlates of conflict and violence. The objective of many country-level studies is to find global or regional determinants of civil war. In this literature review, multiple, influential country-level studies are included, which outline the significant findings of country-level studies, their assumptions, frequently used determinants, and overall methodological procedures.

Paul Collier and Anke Hoeffler, from the University of Oxford, published the article “Greed and grievances in civil war” in 2004. These authors note that the political science discipline has contributed heavily towards the study of the economics of conflict, and the determinants of violence. It has, in particular, offered answers to the following two questions: Why does civil war break out? What contributes to prolonged civil wars and violence?

For one, the political science literature explains violence and civil war “in terms of motive” (Collier and Hoeffler 2004). Hence, conflict is seen as a reaction toward a particular social and/or economic situation, which gives sufficient motivation to rebel against the status quo. Rebellions or civil wars are seen as a pathway toward institutional change and reform in a society. It occurs when the grievances have been significant enough to provide a motivation for violent protest.

Economists offer another explanation. Civil war and rebellion can be explained “in terms of opportunity” (Collier and Hoeffler 2004). According to this explanation, civil war and rebellion must be understood in terms of a cost-benefit analysis. The benefits of rebellion must outweigh the cost of rebellion, and the explanation of civil war and rebellion becomes necessarily economic.

Collier and Hoeffler “propose a more general theory which juxtaposes the opportunities for rebellion against the constraints” (Collier and Hoeffler 2004). Furthermore, the authors decide to treat the explanations for the “initiation and duration” separately, with this article focusing solely “on the initiation of rebellion” (Collier and Hoeffler 2004). The authors develop a model explaining the initiation of violence, including multiple explanatory variables.

Collier and Hoeffler use an aggregated approach to study determinants of civil war and violence. The authors use a data set developed by Small and Singer, which covers 169 countries identifying 79 civil wars ranging from 1965 to 1999. The dependent variable in this case is the outbreak of civil war in a country in a five year period; the variable is coded as zero, if no civil war breaks out, and as one, if a civil war breaks out. Additionally the regression analysis is “non nested” (Collier and Hoeffler

2004), which means that the grievances and greed explanatory variables are tested in two separate models: one model tests the grievance hypothesis, and the other tests the greed hypothesis.

The greed or opportunity variable explains civil war or violence as a consequence of economic opportunity. The authors justified the inclusion of variables either by economic intuition or because the literature of the economics of conflict has determined them to be important variables to consider. Looting or the extortion of resources can often be used as a source of finance for conflicts, and the variable “primary commodity exports / GDP” was included for that reason. There are also often significant opportunity costs for fighters in a civil war; the greater the education level of a potential fighter, the greater the opportunity cost for a fighter to join a rebellion, due to higher forgone wages. This led to an inclusion of the male secondary schooling variable, which attempts to show the opportunity costs for fighters. Furthermore, the variable GDP growth was included to measure the influence of economic growth on the outbreak of civil war.

The authors also included the variables “mountainous terrain, population dispersion and social fractionalization” (Collier and Hoeffler 2004) to measure possible military advantages enjoyed by opposition or rebel groups. If a country is more mountainous, rebels or opposition groups could seek shelter and protection in the mountains, and such cover makes civil war and conflict more likely.

The “objective grievance” (Collier and Hoeffler 2004) model measures the impact of grievances upon the likelihood of civil war and conflict. It does not attempt to explain civil war as a consequence of economic factors, but believes that grievances motivate

people to initiate or participate in civil war. The authors include “religious and social fractionalization” (Collier and Hoeffler 2004), polarization of the society, and ethnic dominance of a group as explanatory variables. As societies become more plural, and share power less equally the potential for civil war should rise.

Furthermore, the authors include a “democracy” variable measuring the impact of democratic institutions upon conflict and civil war propensity. The authors also include “income inequality” and “land inequality” (Collier and Hoeffler 2004) as explanatory variables. Inequality in asset ownership could be a motivating factor for people to initiate a civil war or rebellion.

The “model that focuses on the opportunities for rebellion performs well” (Collier and Hoeffler 2004), whereas the perceived grievance model does not perform well. The authors highlight that primary exports, in particular oil, can be a significant source of finance that make civil wars and conflicts possible. The existence of a primary export commodity rises conflict and civil war propensity in a society. Additionally, “low foregone wages” (Collier and Hoeffler 2004) impact the decisions by individuals to participate in civil war and rebellion. If individuals have low earning and economic potential, the probability of participating in a civil war for these individuals increases. Hence, low earnings and low economic potential raises the likelihood of conflict and civil war.

Military advantages are also important to consider in this discussion; in particular geographic dispersion of the population increases the probability of civil war and rebellion.

The objective grievance model suggests that ethnic dominance by a particular ethnic group raises conflict potential, and democracy reduces the probability of civil war.

The article concludes that economic opportunities enable civil wars, and civil wars can be better explained through economic explanations. The authors are not willing to dismiss objective grievances as a common cause of civil wars and conflict though, but “the grievances that motivate rebels may be substantially disconnected from the large social concerns of inequality, political rights, and ethnic or religious identity” (Collier and Hoeffler 2004).

The article “Ethnicity, Insurgency, and Civil War” was written by James Fearon and David Laitin in the *American Political Sciences Review*. The article explores the reasons for civil war and violence in several countries between 1950 and 1999. In this time period, the casualties of intrastate conflict outnumbered the casualties of interstate by a “factor of five” (Fearon and Laitin 2002). The authors dismiss the standard explanations of the political sciences literature in regard to the occurrence of conflict and civil war. Civil wars have not been more common since the end of the cold war era, “a greater degree of ethnic or religious diversity” (Fearon and Laitin 2002) is not a determinant of civil wars, and lastly the authors express that there is “little evidence in favor of the dominant view that one can predict where a civil war will break out by looking for where ethnic or other broad political grievances are strongest” (Fearon and Laitin 2002).

Fearon and Laitin responded to the article “Greed, and Grievances in Civil War” by Collier and Hoeffler. Collier and Hoeffler argued that war and violence can be explained primarily by economic opportunities, and not by perceived grievances. Civil wars are caused and enabled by economic reasons, not by social or political reasons. Fearon and Laitin dispute this proposed explanation, and offer an alternative. “Our

theoretical interpretation is more Hobbesian than economic” (Fearon and Laitin 2002). The strength of institutions and of the state is the primary determinant of civil war and conflict. “Where states are relatively weak and capricious, both fears and opportunities encourage” (Fearon and Laitin 2002) the occurrence of civil wars and conflict.

Historically, “few scholars argued that the real source of rebellion was often ethnic nationalism” (Fearon and Laitin 2002). The authors test this hypothesis using a data set of civil war outbreaks between 1945 to 1999. The analysis of the researchers shows that “for given levels of country income, no consistent effect is associated with variation in ethnic homogeneity” (Fearon and Laitin 2002). Furthermore, religious fractionalization does not increase the probability of civil war either.

“Per capita income” (Fearon and Laitin 2002) is a very significant explanatory variable. “Per capita income (measured in thousands of 1985 U.S. dollars and lagged one year) is strongly significant in both a statistical and substantive sense. \$1,000 less in per capita income is associated with 45% greater annual odds of civil war onset, on average” (Fearon and Laitin 2002). More surprising is that “civil war onsets are no less frequent in democracies after controlling for income, as shown by the positive and statistically insignificant coefficient for Democracy” (Fearon and Laitin 2002). The authors suggest that per capita income is a statistically significant variable explaining civil war propensity in a society. Income inequality on the other hand is not statistically significant, and does not provide an explanation for the outbreak of civil wars.

Whether or not a country has a democratic political system does not impact civil war propensity, but anocratic countries, countries with a mixed political system containing autocratic and democratic elements, have a much greater probability of civil

war breaking out. The instability of such political systems increases the likelihood of a civil war being successful, which makes civil wars more feasible for opposition groups. Additionally,” the odds of civil war onset are estimated as 5.4 times greater in the first two years of a state’s independent existence than in other years, which is a huge effect” (Fearon and Laitin 2002). The political stability of a country impacts conflict propensity. Fragile and new states have a greater propensity of conflict.

Based on their study, the authors reject many determinants of civil war, which other researchers in the discipline find significant and important. Fearon and Laitin state:

The conditions that favor insurgency – and in particular state weakness marked by poverty, large size, and instability – are better predictors of which countries are at risk for civil war than are indicators of ethnic and religious diversity, or measures of grievances such as economic inequality, lack of democracy or civil liberties, or state discrimination against minority religions or languages. (Fearon and Laitin 2002)

The authors claim that demographic and ethnic factors are not determinants of civil war and conflict. They also point out that civil wars can break out, if a relatively small force encounters economic hardships, and the possibility of hiding from the government or military is given. Civil war must not be a large scale event initiated by a significant movement in the population, but rather a small pocket of the population suffices to initiate a rebellion. “Civil wars of the period have structural roots, in the combination of a simple, robust military technology and decolonization, which created an international system numerically dominated by fragile states with limited administrative control of their peripheries” (Fearon and Laitin 2002).

In 2002, the Journal of Conflict Resolution issued a special issue, “Understanding Civil War”. In this issue, the journal summarizes the current literature on civil war and

violence in societies, and publishes new research findings. Paul Collier wrote the introduction to the special issue, and in it, he explains his view on the current state of the discipline.

Collier emphasizes that economics can and should contribute to this debate and research agenda. Conflict and civil war “might have economic causes, as well as the more obvious economic consequences” (Collier and Sambanis 2002). Civil wars can be caused, or the initiation of them influenced, by economic factors, which is an overlooked dimension of conflict. Furthermore, civil war and conflict have economic ramifications for a society. Collier states that because of these two important principles, the economic discipline has to continue to contribute to the research agenda of civil wars and conflict. Both, political science and economics have an important role to play in furthering our understanding of the causal relationships between determinants and civil wars.

Collier begins his discussion by stating possible explanations for the causes of conflict. In the political science literature “conflict would be explained by well-grounded preference” (Collier and Sambanis 2002). The situation individuals or groups find themselves in motivates them to initiate civil war and violence to alter their situation. “The economics literature has assumed that the motivation for rebellion is not grievance but greed” (Collier and Sambanis 2002). Conflict and civil war are motivated by the opportunities they create or offer. Conflict occurs when it is profitable for the involved actors. Another explanation “for conflict is misperception” (Collier and Sambanis 2002). The important aspect here is that actors decide upon conflict based on their perceived opportunities and grievances. Information plays an important role in the initiation of

conflicts, and misinformation influences when and how civil war and conflicts play itself out.

Collier then expounds on the reasons why conflicts prolongate and continue to exist. “Conflicts may endure because of misperceptions (or private information) about relative strength” (Collier and Sambanis 2002). If the agents are uncertain who will win a rebellion or civil war, they will be motivated to continue the civil war or rebellion. Imperfect information can be a reason for the prolonged continuation of conflicts.

Furthermore, rebels are frequently not willing to disarm or stop their participation in a civil war, because doing so would increase their potential to be harmed by the government. The government also has frequently no incentive to cease the conflict, since it could lead to a power sharing agreement with the rebels. Conflict continues because the cessation of conflict would make one or both of the parties worse off. Hence, once conflict has started, little motivation exists to cease such conflict.

Prolonged conflict and civil war is often the result of “antithetical and irreconcilable preferences” (Collier and Sambanis 2002). Such varying preferences would make it difficult for different agents to reach a settlement and agree on peace, if they were already engaged in a civil war. If motivation and preferences are strong enough and too antithetical, settlements of conflict become more difficult to achieve. Thus, conflict often becomes a “path-dependent process” (Collier and Sambanis 2002). Once civil war or violence occurs, stopping it becomes difficult and states of aggression are often self-reinforcing.

The article “Ethnicity, Political Systems, and Civil Wars” was published in 2002 in the Journal of Conflict Resolution by Marta Reynal-Querol. The researcher begins the

article by discussing the causes of civil war. In 1998, Collier and Hoeffler had concluded that “more fragmented societies are not more prone to civil war than the rest” (Reynal-Querol 2002). Collier and Hoeffler had rejected the notion that ethnic fragmentation plays an important role in determining where civil wars and violence occur. Reynal-Querol argues in this article that the conclusion reached by the researchers was incorrect, and argues that ethnic and religious fragmentation play a crucial role in understanding civil war and violence. Reynal-Querol also argues that researchers should distinguish between different types of civil war: some civil wars are primarily ethnic and religious and others are caused by economic grievances.

The study reaches three major conclusions. First, “religious polarization and animist diversity” (Reynal-Querol 2002) have explanatory significance in explaining the incidence of civil war and conflict. Reynal-Querol used a different data source for religious fragmentation, which distinguishes between Animistic, Christian, and Muslim religious affiliations more accurately and combines various data sources into one. Second, the author determines that “religious polarization is more important as a social cleavage that can develop into civil war” (Reynal-Querol 2002). Religion has the potential to increase social conflict and violence for two particular reasons: “religion can be exclusive” (Reynal-Querol 2002) in nature separating people from each other. Religion also implies that people understand the world in different ways. These differences in understanding can extenuate conflicts and make them at times even necessary. The researchers also determined that religious differences are more important than linguistic differences in determining conflict and civil war. Linguistic differences do not polarize a society as strongly as religious differences do. Lastly, a

“consociational democracy is a political system that significantly reduces the incidence of ethnic civil war”. A consociational democracy provided guaranteed group representation, and attempts to share the power between various factions in society. The author remarks that democracy itself does not reduce the potential for conflict and violence, but that equal representation and power sharing reduces conflict potential.

The article *Recruitment and Allegiance: The Microfoundations of Rebellion* was published in 2002 in the *Journal of Conflict Resolution* by Scott Gates. The article focuses on the “enforcement mechanisms available to rebel groups” (Gates 2002). Rebel organizations exist outside of the legal structure of society and are by definition not under control of the government. It is the government that usually has the most influence on who defines and determines the rules and configurations of institutions, both formal and informal, which govern the interaction of various agents in a society. “By definition, a rebel group exists outside the legal realm of the state, and contract enforcement is the root of recruitment and allegiance” (Gates 2002). This study attempts to understand how rebel groups organize themselves, how allegiances are formed, and how collective action is created. In other words, the researcher attempts to shed further light on the organizational structure that allows rebel groups to exist. Further clarifying, the author does not attempt to understand what allows groups or people to form into a fully fledged rebellion, but what allows rebel groups to continue to exist and operate. Hence, “the model developed explores the theoretical foundations underlying the duration of civil war” (Gates 2002).

The author focuses on “the geographic, ethnicity, and ideological” (Gates 2002) roles that shape the organizational structure of a rebel force. The author distinguishes

between two types of rewards that participants in a rebellion usually experience: “rent-seeking activities” (Gates 2002) or “nonpecuniary rewards” (Gates 2002). Rent-seeking awards are primarily financial benefits, such as looting, that participants of a rebellion share in, and nonpecuniary rewards can be differentiated into “functional and solidary” rewards (Gates 2002). Functional rewards refer to the utility received from the action itself, such as the utility received from fighting or conspiring, but also the utility received from working on the lofty goals of a rebellion, such as overthrowing the government and establishing a democracy. Solidary rewards refer to the utility received from the “camaraderie among members of an armed rebel group” (Gates 2002). Rebel groups differ from each other in the types of rewards they offer, and the amount of rewards they offer.

The authors then propose that individuals decide to participate in a rebellion, if the offered rewards from participating are greater than the rewards offered by “all outside options” (Gates 2002). Gates defines participation in a rebel movement as a cost benefit analysis, where the benefits, in financial and non-financial form, exceed the cost of participation.

Rebel armies face the problem of “enforcement” (Gates 2002) and compliance. Members of the rebel army often have an incentive not to comply, or adhere to the commands of the leadership of the rebel group. Facing this problem, a rebel group must create enforcement mechanisms that diminish the likelihood of noncompliance. Punishment is a frequently employed strategy to deal with the problem of noncompliance. Gates proposes that geographic location plays an important role in the ability to enforce compliance for rebel groups. “Geographical distance results in a

decreased ability to successfully punish defection. If agents are far away, they are going to be more difficult to punish, if they choose to defect” (Gates 2002). Additionally, ideological or ethnically homogenous rebel groups will have greater amounts of “functional and solitary rewards” (Gates 2002) at their disposal. Ethnic and ideological unity can help unify a rebel group, increasing the benefit of rebellion to rebel fighters.

Military altercations are determined by the “military capabilities” (Gates 2002) of both the rebel group and the government. “Consider military capability as defined by military effectiveness, distance as it relates to geography, and a stochastic element that incorporates aspects of technology, strategy, and random idiosyncratic factors” (Gates 2002). Military strength is partly defined by a stochastic element introducing a random or variable term. Additionally, the author believes that distance towards “the center of the government territory” (Gates 2002) plays a crucial role in determining military success. Government groups are more likely to win battles against the rebel groups the closer they are to the center of their territory. Geography also plays a role in allowing safe havens for the group.

Sanctuary within a country or within a neighboring country play an instrumental role in giving the rebel movement a chance to develop and grow. Sanctuary implies a place to retreat away from governmental forces. Typically, such sanctuaries are in remote territories well away from the center of government. (Gates 2002)

However, “ethnicity or ideology can overcome geographic proximity” (Gates 2002). The benefits from rebellion can be high enough for a group to outweigh the proximity to the government, and proximity is not an all determining factor of rebellion. As long as significant rewards exist, civil wars and rebellions can rise up independent of location.

The study attempts to understand the underlying factors that allow rebel groups to organize. Geographic dispersion can be an important factor allowing rebel groups to form and to maintain organizational structure. Additionally, ideology and ethnicity serve as a crucial factor creating nonpecuniary rewards for participations of rebellion. The stronger the ideological and ethnic ties are, the greater the nonpecunarity rewards can be. “Using a formal model featuring the organizational structure of rebellion, this study demonstrates that physical geography, ethnicity, and ideological distance play an important role in determining military success, deterring defection within a rebel group, and shaping recruitment” (Gates 2002).

The article, *Third-Party Interventions and the Duration of Intrastate Conflict*, was published in the *Journal of Conflict Resolution* in 2002 by Patrick M. Regan. The article focuses on the impact of third-parties upon the duration of civil wars. Third-parties are understood to be foreign military forces or multinational peace keeping forces. These third party interventions are usually in the form of a military intervention, but can also be economic or social interventions. The overall goal of the interventions is “some form of conflict management” (Regan 2002).

The researchers begin with the assumption that the goal of intervention, from a third-party, into a civil war is to control and manage the violence occurring in it. The goal of the third-party is to influence the costs and benefits of fighting, and changing them so that peace and the settlement of conflict will become the preferred outcome. A conflict can be understood as successive moves by various actors gaining an understanding of their likelihood to win the conflict, and their potential payouts from it. The conflict is settled, when we reach equilibrium, where both parties are willing to settle the conflict.

An intervention can influence the potential benefits and costs both to continued rebellion and to reaching a settled conflict faster. “The willingness to settle a conflict today versus continuing to fight until victory is a function of expectations of future victory and current and anticipated costs” (Regan 2002).

If the intervention is on the side of the government, Regan argues that the power balance is shifted further towards the government, and the government can expect to have a greater probability of winning the conflict. “In other words, an intervention on behalf of the government should lead to shorter conflicts” (Regan 2002). Interventions on behalf of the rebel group or opposition would shift the power towards the rebel group impacting costs and rewards of continuing to fight both for the government and the rebel group.

The timing of the intervention is also important to consider. In the early stages of a rebellion, the rebel forces are often less organized and their military strength is often marginal. As time goes on and the rebel movement survives, the organizational structures of the rebel group solidifies, and the rebel group usually gains in military strength. “Therefore, an intervention that takes place early in an armed rebellion should have a considerably greater impact on the future course of the conflict” (Regan 2002). When an intervention occurs matters to the outcome of the conflict and the impact the intervention can have itself.

The authors then use the “Weibull model of conflict duration” (Regan 2002) to test empirically the impact of intervention on the length of civil wars. The conclusion of the analysis is rather surprising. “Intervention themselves – whether military or economic – do not act as effective tools of conflict management” (Regan 2002). The

data and methodology used in this study suggests that “the timing of an intervention appears to have little or no effect on the duration of a conflict” (Regan 2002). Lastly, “a biased intervention” (Regan 2002), i.e., an intervention on behalf of one of the conflict sides, reduces the duration of conflict in comparison to a neutral intervention. The important conclusion, according to the authors, is that an intervention does little to reduce the length or duration of the conflict. Hence, the authors question the effectiveness of military interventions in conflict.

The article “Do Ethnic and Nonethnic Civil Wars Have the Same Causes?: A Theoretical and Empirical Inquiry (Part 1)” was published in 2001 in the *Journal of Conflict Resolution* by Nicholas Sambanis. According to the author, “a wave of theoretical and empirical research has recently helped to identify important economic and political determinants of civil war onsets and prevalence” (Sambanis 2001). The theoretical work lumps all civil wars into a single homogenous category, and researchers identify determinants of civil war using a single homogenous category. However, Sambanis argues that there are different types of civil wars, and an analysis of civil wars must be done according to the specific causes of the civil war. There are two primary causes of civil wars: “causes of identity (ethnic/religious) and nonidentity civil wars” (Sambanis 2001). To distinguish between the two causes of civil war, the definition of ethnicity and ethnic wars has to be established. Ethnic wars are

episodes of violent conflict between governments and national, ethnic, religious, or other communal minorities (ethnic challengers) in which the challengers seek major changes in their status... Rioting and warfare between rival communal groups is not coded as ethnic warfare unless it involves conflict or political power or government policy. (Sambanis 2001)

All other civil war are characterized as nonidentity wars.

Collier and Hoeffler (Collier and Hoeffler 2004) and Fearon and Laitin (Fearon and Laitin 2002) argued for an economic explanation of civil wars and conflict. According to these researchers, ethnic and political fractionalization does not explain the causes of civil war in a country. Collier and Hoeffler even argue that as ethnic fractionalization rises the probability of civil war decreases. “The authors argue that the more diverse a society, the less likely it is to experience a civil war” (Sambanis 2001). Both Collier and Hoeffler, and Fearon and Laitin argued that civil war is primarily caused by economic factors. As long as the benefits of rebellion and civil war are greater than the cost of civil war and conflict, civil war will occur.

Sambanis argues that Collier and Hoeffler and Fearon and Laitin arrived at this conclusion due to faulty a-priori assumptions. “The new economic theories of civil war do not consider if different war types have different causes, and their research design, which aggregates all civil wars in a single category, implicitly suggest that there are no such differences” (Sambanis 2001). Sambanis uses a data set, which distinguishes between ethnic and revolutionary civil wars. The underlying assumption here is that the causes of such wars are fundamentally different, and only a disaggregated approach will help us understand the determinants of civil wars for both fundamental cases.

Sambanis uses a probit model to identify the determinants of ethnic civil wars. “High levels of democracy are robustly significant and much more so than economic development” (Sambanis 2001). Political variables have previously been determined to be insignificant in analysis of civil war; in this disaggregated approach political variables have become significant. Economic variables are insignificant and non-explanatory for ethnic civil wars. Ethnic fractionalization “is among the most robustly significant

variables and is positively correlated with the onset of ethnic war: as a country becomes more heterogeneous, the probability of occurrence of an ethnic war increases”

(Sambanis 2001). Furthermore, whether or not a neighbor is in a civil war is an important factor as well. If neighboring countries are at war, the probability of civil war increases significantly. The amount of time elapsed, since the last civil war, also impacts the probability of civil war breaking out. The longer removed the last outbreak of a civil war is, the less the probability is that a civil war will break out in a country.

Sambanis’ study has concluded that significant differences between ethnic and non-ethnic civil wars exist, and determinants vary. Ethnic civil wars have a causal relationship with the following variables: the level of democratization in country, the time elapsed since the last civil war, ethnic fractionalization, and neighbors being at war.

Non-ethnic civil wars have a causal relationship with the following variables: the level of economic growth, overall GDP, and the population size in a country. Sambanis concludes:

Ethnic heterogeneity is significantly and positively correlated with the onset of ethnic wars, whereas the economic literature on war initiation has suggested that ethnic heterogeneity either decreases the risk of war onset or has no significant association with the risk of war. (Sambanis 2001)

Sambanis argues that two types of civil wars exist, and both types of conflict have varying and unique determinants.

The article “Cursed by Resources or Institutions?” was published in 2006 in the *The World Economy* journal by Halvor Mehlum, Karl Moehne, and Ragnar Torvik. The article attempts to understand and explain “the diverging impact of natural resources on economic development across countries?” (Mehlum, Moene, and Torvik 2006). Some countries benefit significantly from natural resources, and other countries do not benefit

at all from the immense potential offered by the natural resources abundance in their countries. The authors suggest that “the explanation can be found in institutional differences” (Mehlum, Moene, and Torvik 2006) between countries.

The researchers distinguish institutions into “grabber-friendly institutions” and “producer-friendly institutions” (Mehlum, Moene, and Torvik 2006). Grabber-friendly institutions allow producers, entrepreneurs, or individuals to benefit from an activity or natural resources through the mechanism of rent seeking. Actors, participating in grabbing, profit from natural resources or opportunities by “expropriation”, “unfair takeovers”, “fraud” and “venal practices” (Mehlum, Moene, and Torvik 2006). A grabber-friendly institution enables or tolerates rent seeking activities, and wealth is not a function of participating in productive activities.

A producer-friendly institution is marked by “low corruption in government”, “high bureaucratic quality”, and “low risk of government repudiation of contracts” (Mehlum, Moene, and Torvik 2006). Economic profits only can be gained by entrepreneurs through productive and profitable economic behavior, and rent-seeking is not a feasible alternative. As institutional quality in a country rises, it becomes less profitable to engage in rent-seeking activities, and incentives of entrepreneurial behavior rises.

The researchers assess impact and “interaction between resource abundance and institutional quality” (Mehlum, Moene, and Torvik 2006). The result of this study is that “institutional quality is the key to understanding the resource curse: when institutions are bad, resource abundance is a growth curse; when institutions are good resources abundance is a blessing” (Mehlum, Moene, and Torvik 2006). The somewhat surprising finding is that “countries rich in natural resources” (Mehlum, Moene, and

Torvik 2006) with high institutional quality have the highest growth rates. The next highest growth rates are experienced by countries with high institutional quality and low resource abundance, followed by countries with low institutional quality and low resource abundance. The countries with the lowest growth rates have low institutional quality and high resource abundance.

In 2006 Håvard Hegre and Nicholas Sambanis published the article “Sensitivity Analysis of Empirical Results on Civil War Onset” (Hegre and Sambanis 2006) in the *Journal of Conflict Resolution*. In “the empirical study of civil war onsets” (Hegre and Sambanis 2006), there is significant uncertainty about factors impeding and influencing the occurrence of civil war and political conflict. The causal inferences are tenuous at best, and there “is little agreement” (Hegre and Sambanis 2006) about the significant determinants of civil war. Overall, “there is thus uncertainty about the inferences that we can make based on empirical results of civil war” (Hegre and Sambanis 2006) studies. Hence, the authors employ a sensitivity analysis testing the robustness of models and included variables. “First, we test the sensitivity of commonly cited, substantively important results to small changes in the set of variables included in a regression. Second, we test how fragile our substantive inferences are to small changes in the way we operationalize theoretically significant variables (which we call “concept variables”)” (Hegre and Sambanis 2006).

To assess the robustness of the model and specifications, the researchers “apply Sala-i-Martin’s less stringent test, which involves looking at the entire distribution of parameter estimates to determine the level of confidence in each of the explanatory variables” (Hegre and Sambanis 2006). Sala-i-Martin uses the following model form:

$$y_i = \alpha_j + \beta_{yj}Y + \beta_{zj}Z_j + \beta_{xj}X_j + \varepsilon \quad (\text{Equation 2-1})$$

“ $y_i$  is the dependent variable variable” (Hegre and Sambanis 2006), “ $Y$  is a vector of three variables that always appear in the regression” (Hegre and Sambanis 2006), “ $z$  is the variable of interest” (Hegre and Sambanis 2006), and “ $x$  is a vector of up to three variables” (Hegre and Sambanis 2006) taken from a pool of possible, explanatory variables. The distribution of estimated t-values is then calculated from the various model specifications, thus indicating whether certain variables are significant or insignificant. This allows the researcher to identify if variables are robustly significant or insignificant in explaining the onset of civil war.

The researchers always include “three core variables” (Hegre and Sambanis 2006) in all of their models:

The natural log of population ( $\ln pop$ ), the length of peacetime until the outbreak of a war ( $pt8$ , which we model as a decay function of time at peace), and the natural log of per capita gross domestic product (GDP) in the constant dollars ( $\ln gdp$ ). (Hegre and Sambanis 2006)

Furthermore, the dependent variable, in this case, is the onset of civil war, with 1 indicating the outbreak of a civil war in a given time period and 0 indicating a peaceful time in a country in a given time period.

In his original model, Sala-i-Martin uses a combination of “three x-variables for each z-variable” (Hegre and Sambanis 2006). Hegre and Sambanis alter the Sala-i-Martin by using “concept variables” (Hegre and Sambanis 2006). A concept variable is a category under which a variable falls, for example the authors define political systems, centralization, or colonial war to be concept variables. “To avoid including variables that measure the same thing in the same model, we restrict the combination of x-variables to those that measure three different concept variables” (Hegre and Sambanis 2006). The

authors include a broad variety of variables in this study. The variables, chosen for this study, have been included in other studies, which attempted to explain the onset of civil war. The included concept variables are “ethnic fragmentation”, “ethnic dominance/polarization”, “level of democracy”, “inconsistency of political institutions”, “political instability”, “political system”, “centralization”, “neighborhood political economy”, “region”, “neighborhood war”, “growth”, “economic policy”, “social welfare”, “resources”, “terrain, geography, population distribution”, “militarization”, “time”, and “colonial war” (Hegre and Sambanis 2006).

Overall, the researchers include “eighty-eight variables”, which “produced 4.7 million logistic regressions” (Hegre and Sambanis 2006). “The GDP per capita variable is robustly significant”, and when income falls “by one standard deviation” the risk of civil war decreases by 65 percent (Hegre and Sambanis 2006). The population variable also has a significant result, and as population increases in a country the risk of civil war rises as well. However, one of the core variables is not as robust as the previous two variables. The time elapsed since the previous conflict is not significant in explaining the onset of civil war.

Overall, the authors “identified robust operationalizations for up to twelve concept categories, and eighteen variables have average p-values less than .05 under the least restrictive assumption” (Hegre and Sambanis 2006). “We have found other robust relationships: civil wars are more likely to occur in countries with recent political instability and inconsistent democratic institutions; countries with small militaries and rough terrain; countries located in war-prone, undemocratic regions; and countries with low rates of economic growth” (Hegre and Sambanis 2006). Many other variables do

not explain the onset of civil war though, such as resource dependence. The problem and issue uncovered by this study is the frequently tenuous inference made by researchers in the discipline. The goal of this study was to identify more causal factors, which robustly explain the onset of civil war. The authors encourage researchers to “substitute closely related but differently measured variables in their regressions and add control variables to make sure the result on focus variables are robust before making causal inferences” (Hegre and Sambanis 2006).

### **Disaggregated Studies of Violence, Conflict, and Civil War**

Disaggregated studies of violence, conflict, and civil war have a different methodological approach than country-level studies. Disaggregated studies examine conflict not at a national level, but at a small-scale level. A country is divided into various regions or geographic areas, most commonly a raster, which then serves as the unit of analysis. A raster typically consists of a matrix of cells organized into rows and columns, where each cell is of an identical size.

Conflict and civil war intensity is not homogenous throughout a country, but varies within it. Conflict intensity can be high in one part of a country and low in another part of the country, and frequently civil war is limited to a certain region of the country. By design, country-level studies must assume homogeneity of conflict diffusion in a country, which can introduce significant causal inference problems. Disaggregated studies account for conflict diffusion and can focus on local determinants of conflict.

The article “Accounting for scale: Measuring geography in quantitative studies of civil war” was published by Halvard Buhaug and Päivi Lujala in the *Journal of Political Geography* in 2005. The authors argue that historically it had been assumed that there is a strong link between geographical factors and the prevalence and occurrence of civil

war. “Empirical studies have been less than successful in establishing a clear link between the geographical distribution of physical and human factors in civil war” (Halvard Buhaug and Lujala 2005) though. Using national or aggregate data sets, researchers have been unsuccessful in establishing a clear causal link between geographical factors and the prevalence of civil war. According to the authors, the use of disaggregated or small-scale level data would be suitable to understand causal structures of civil war, and small-scale and disaggregated data has two particular advantages. For one, “civil conflicts are by definition subnational events, and the fighting rarely spans entire countries” (Halvard Buhaug and Lujala 2005). Using aggregated data or country level data to assess civil war consequently is erroneous, since such analysis would include areas not impacted by the civil war, which are not relevant for the analysis. Second, “conflict promoting factors, such as terrain, natural resources, population distribution, and ethnic composition have substantial variation” (Halvard Buhaug and Lujala 2005). Disaggregated studies can consider these variations, and include them in their analysis, which increases the internal validity of them. “We need to control for sub-national variations since there may be huge deviations between national-level statistics and conflict-specific characteristics” (Halvard Buhaug and Lujala 2005). The researchers point out that GIS (Geographical Information System) generated datasets allow for sub-national analysis to take place.

The researchers developed two different models to test, whether or not there are significant differences between country-level analysis and “conflict-specific” (Halvard Buhaug and Lujala 2005) analysis, which is the small-scale disaggregate approach. The model measures the impact of various geographic variables upon the duration of civil

war using a “Weibull regression model” (Halvard Buhaug and Lujala 2005), and employing “the Armed Conflict dataset” (Halvard Buhaug and Lujala 2005).

For the country analysis, the researchers include country size, population, territorial conflict, initial density, mountainous regions, forest covers, rainy season, commodity exports/ GDP, gemstones, coca, cannabis, and opium as explanatory variables. For the conflict-level analysis, the same general explanatory variables are used. The difference between the two models is that the country-level model include “country-level measures of geography” (Halvard Buhaug and Lujala 2005), whereas the conflict-level model includes disaggregated or small-scale measures, which consider the variations inside of a country.

The result of the analysis is that “the scale of measurement affects not only standard errors and significance levels but even the substantive impact of some regressors” (Halvard Buhaug and Lujala 2005). The conflict-level analysis indicates that the prevalence of “gemstones” has a significant impact upon the duration of conflicts, whereas the country level analysis rejects such correlation. Additionally, the conflict-level model shows no significant impact of mountainous terrain upon the duration of conflict, whereas the country-level analysis shows a significant impact. Another discrepancy between the models is the effect of forest cover upon the duration of conflict. The country-level analysis shows a significant effect upon conflict duration, and the conflict-level analysis did not show such an effect. Importantly, the conflict-level analysis included the distance to capital as an explanatory variables, which could not be included in the country-level model. “The most influential factor in the conflict-specific model is the relative location. Civil wars occur at a distance from the capital – the

presumed center of state power – are much more likely to turn into protracted contest than relatively proximate ones” (Halvard Buhaug and Lujala 2005).

The authors conclude that the use of disaggregated data, in conflict analysis, is “undoubtedly more accurate and representative than country-level statistics” (Halvard Buhaug and Lujala 2005). Civil wars are regional in nature, and the use of GIS-generated data improves the analysis of such conflicts.

The article “Local Determinants of African Civil Wars, 1970 – 2001” was prepared for the “Disaggregating the Study of Civil War and Transnational Violence” conference in 2005 by Halvard Buhaug and Jan Ketil Rød. The literature of civil war and conflict has not been able to explain “origins of conflict fully” (Halvard Buhaug and Rød 2005). The unit of analysis in the study of civil war and conflict traditionally was the individual country. “Civil conflict by definition involves at least two actors within the boundaries of the nationstate” (Halvard Buhaug and Rød 2005), consequently using the country as the unit of analysis is incorrect, since it aggregates the determinants and characteristics of a country, without maintaining the variations and differences existing inside of a country. The authors mention three primary reasons why such methodology is continued to be used: there is a lack of disaggregated datasets, explanatory variables are frequently measured at the country-level and not at a disaggregated level, and “analyses of risk of conflict need to include null cases...and the country might appear to be the only suitable unit of observation” (Halvard Buhaug and Rød 2005). The authors argue that the disaggregated approach is superior to the aggregated approach, and should be used to study civil wars and conflicts.

The researchers develop a model to test “where civil wars break out on a subnational level” (Halvard Buhaug and Rød 2005). The country is disaggregated into “grids of 100km by 100km “(Halvard Buhaug and Rød 2005), which now serve as the unit of analysis. The authors use the Uppsala/Prio ACD project dataset, which “includes every contestation between a state government and an organized opposition group that caused at least 25 battle-deaths per year” (Halvard Buhaug and Rød 2005). In this dataset, the conflict is assigned a “circular zone of conflict by means of a center point” (Halvard Buhaug and Rød 2005). The authors then test how covariate variation impacts the prevalence or outbreak of violence in the different units of analysis. Their objective is to test several hypotheses from the literature of civil war and conflict concerning the determinants of the prevalence of civil war.

Road density “is negatively associated with the risk of civil war” (Halvard Buhaug and Rød 2005). Remote regions are more difficult to control for governments and cannot easily be reached. Additionally, regions with lower road density have typically lower economic development. Hence, as road density increases, the probability of civil war falls. The authors use road data to determine the “total length (km) of major roads” in each unit of observation.

The next hypothesis is that “proximity to valuable resource deposits is positively associated with the risk of civil war” (Halvard Buhaug and Rød 2005). In the literature, there has been an argument that rebels are, at least in part, motivated by economic gains, which often present themselves in the form of natural resources. Rebel groups loot natural resources, and frequently depend on the income of looting.

Additionally, the literature has also suggested that ethnic fractionalization impacts the probability of conflict. “Local dominance of a language that differs from the dominant language in the country is positively associated with the risk of civil war” (Halvard Buhaug and Rød 2005). Ethnic differences result in political, social, and economic differences, increasing the conflict potential between various ethnic groups.

“Mountainous and forested terrain is generally believed to facilitate rebel movement by providing shelter out of reach of government forces” (Halvard Buhaug and Rød 2005). Additionally, geographic dispersion has frequently been mentioned as an important factor. As regions of the country have a greater geographical dispersion from the capital or center of the country, these areas become more difficult to control, and it becomes more probable for rebellions to begin or start there. “Local population density is negatively associated with the risk of civil war” (Halvard Buhaug and Rød 2005). In other words, as population density rises the risk of civil war falls. The logic behind this is that rebel groups find it easier to organize and sustain themselves in the outlying, non-densely populated regions.

The researchers distinguish between two types of civil war in Africa: territorial war, in which the rebel group attempts to secede from the control of the national government in order to gain territorial control over a region, and governmental wars, in which the rebel group wants to oust the government, and take political control over the country. Territorial and governmental wars have varying objectives and goals.

If there is conflict in a grid, the likelihood of conflict in neighboring grids rises as well. “The onset of conflict shows clear spatial clustering – at least at the selected level of analysis” (Halvard Buhaug and Rød 2005). Additionally, the “risk of civil war is higher

in regions near the state borders and far from the capital” (Halvard Buhaug and Rød 2005). Additionally, conflicts break out “predominantly in the hinterlands and sparsely populated rims of the countries” (Halvard Buhaug and Rød 2005). Surprisingly, “mountainous and forest landscape inhibit rebellion” (Halvard Buhaug and Rød 2005), an overall unexpected result, and the authors propose this finding to be a unique aspect to conflict in the African context.

A closer proximity to natural resources, in particular oil, “increases the risk of separatist rebellion” (Halvard Buhaug and Rød 2005). Overall, insurgency is more likely to occur in regions that are “proximate to a neighboring country”, “at a distance from the center of state power” “sparsely populated”, “flat and without forests”, and “proximate to oil fields” (Halvard Buhaug and Rød 2005).

In the governmental model, the significant explanatory variables differ from the ones determined in the territorial model. “The risk of governmental conflict, such as a coup d’état or a popular revolution is highest in the capital” (Halvard Buhaug and Rød 2005). Furthermore, the likelihood of civil wars and conflict rises in densely populated areas.

The authors “believe that the disaggregated approach has great potential and will prove invaluable as a supplement to conventional country-level analyses” (Halvard Buhaug and Rød 2005). The researchers point out that a disaggregated research approach should be used in cases where sub-national characteristics are of importance.

The article “Poverty and Civil War Events: A Disaggregated Study of Liberia” was published in the Journal of Conflict Resolution in 2009 by Håvard Hegre, Gudrun Østby, and Clionadh Raleigh. The authors attempt “to identify how poverty affects the location

of civil wars” (Hegre, Østby, and Raleigh 2009). In every country, there are areas of relative poverty and relative wealth, and wealth is not equally distributed in a country. “Deprivation and inequality was arguably an important motivation in the Liberian civil war” (Hegre, Østby, and Raleigh 2009), and many fighters were motivated to participate in the civil war because of inequality. The researchers investigate in this article whether or not there is relationship between economic deprivations and the location of civil war.

The authors first develop and explain the theoretical background to their model. The authors introduce the two crucial concepts: “support level” (Hegre, 2009) and “target level” (Hegre, Østby, and Raleigh 2009). “Support level relates to the extent to which a local population is likely to support either the rebel group or the government in a conflict” (Hegre, Østby, and Raleigh 2009). Relatively rich areas of a country can be expected to support the government, whereas the deprived or poorer areas of country can be expected to support rebels. The richer areas protect and support the government since they are the benefactors of the current social and economic system. The poorer areas experience neglect from the government, hence these areas will support rebel groups to change the social and economic system. “Target value refers to the extent to which a location is valuable for either group” (Hegre, Østby, and Raleigh 2009). Certain geographical locations or areas in a country have a greater strategic value for the government or rebel groups. The strategic value of a location impacts the extent to which the various actors have a preference of controlling it and are willing to fight for it.

In the case of Liberia, “the government was very weak” (Hegre, Østby, and Raleigh 2009), and rebel groups were militarily strong. Since the rebel groups are

militarily strong and superior to the government, the conflict will occur in areas more supportive of the government. The rebel groups will attempt to capture or gain control of the areas supporting the government, which were in theory the economically prosperous areas of Liberia. Additionally, “independent of relative strength, the target value argument implies that the risk of conflict events increases with the level of socioeconomic wealth at the location” (Hegre, Østby, and Raleigh 2009). In the Liberian civil war, the access to “alluvial diamonds” (Hegre, Østby, and Raleigh 2009) was important for rebel groups to maintain and secure a source of income. Areas with higher relative wealth, in particular diamond deposits, were more likely to be the target of attacks.

Liberia has a population of 2.5 million people, which can be “divided into sixteen officially recognized ethnic groups living in thirteen counties” (Hegre, Østby, and Raleigh 2009). The civil war in Liberia can be divided into two different periods: “the first (1989-1997) includes Charles Taylor’s insurgency, which led to the surrounding of Monrovia, the killing of Samuel Doe, and finally the electoral process that made Taylor president in 1997” (Hegre, Østby, and Raleigh 2009), and then a “second phase, lasting from 1999 until Taylor’s defeat in 2003” (Hegre, Østby, and Raleigh 2009). The conflict in Liberia occurred between various ethnic factions; some ethnic groups supported the government, whereas other ethnic groups supported the rebel alliances. Overall, “the Liberian conflict followed a clear logic in which warlord pursuit of commerce has been the critical factor” (Hegre, Østby, and Raleigh 2009). The civil war occurred along ethnic factions, but the motivation of the rebel groups can be explained by greed and economic motives.

The authors continue by explaining the aspects of working with a disaggregated dataset. The Armed Conflict Location and Event Dataset (ACLED) “compiles reported information on conflict events by political actors by date and location” (Hegre, Østby, and Raleigh 2009). For Liberia, “the majority of events (90 percent) are battles between governments and rebels” (Hegre, Østby, and Raleigh 2009), and there are “262 reported events from 1989 through 2003” . A basic grid system for Liberia was created with each grid measuring “approximately 8.5 km by 8.5km” (Hegre, Østby, and Raleigh 2009), which created 1,375 squares for Liberia. “The presence or frequency of conflict events is associated with each grid square and ranges from zero events (in 1,312 squares) to thirty-nine events (in Monrovia)” (Hegre, Østby, and Raleigh 2009).

“The geo-referenced information on economic development is derived from the 1986 Liberian-DHS” (Hegre, Østby, and Raleigh 2009). The DHS survey primarily focuses on collecting household data about the health of households, but does include other measures, such as socioeconomic indicators. The researchers use the information “collected on household characteristics to generate a wealth index” (Hegre, Østby, and Raleigh 2009), which is based upon the amount of “household assets” (Hegre, Østby, and Raleigh 2009). However, “only 101 of the 1,375 cells were covered by the Liberian DHS” (Hegre, Østby, and Raleigh 2009), and the vast majority of cells do not encompass a sample point. To overcome this problem, the authors use “the Inverse Distance Weighted (IDW) method”, “which relies on the value of known sample points to estimate the values at surrounding points, using an inverse distance weighting method” (Hegre, Østby, and Raleigh 2009).

Furthermore, the authors “include a set of control variables potentially associated with the location of civil war events” (Hegre, Østby, and Raleigh 2009). The authors include a “dummy which records whether a grid has diamonds within the third-order neighborhood” (Hegre, Østby, and Raleigh 2009). Additionally, the authors include the “regional distribution of ethnic groups” (Hegre, Østby, and Raleigh 2009) as an explanatory variable.

“The number of war events is likely to be dependent on conflict intensity in neighboring squares” (Hegre, Østby, and Raleigh 2009). To include the spatial dependence, a dummy variable, indicating violence in neighboring squares, is included. Furthermore, the authors also include the population density for the different grids, and include a dummy variable if a grid cell has “proximity to international borders” (Hegre, Østby, and Raleigh 2009).

The authors continue by describing the statistical method employed in this study. “The dependent variable in our analysis is the cumulative number of war events in each grid cell over the entire war period” (Hegre, Østby, and Raleigh 2009). The occurrence of violence in a grid cell is not an independent event, but depends upon the violence in other grid cells, as well as previous violence in the grid cell itself. The authors employed “a zero-inflated negative binomial model that allows for a large number of zero-count observations and possible overdispersion within the positive-count observations” (Hegre, Østby, and Raleigh 2009).

The “diamond deposit variable is not statistically significant” (Hegre, Østby, and Raleigh 2009). Diamond deposits do not seem to affect the occurrence of violence in locations. The “ethnic variables” (Hegre, Østby, and Raleigh 2009) do not significantly

explain the prevalence of conflict or violent events either. Furthermore, the amount of conflict in neighboring cells does not seem to have a significant impact either.

“The value of target seems to be the major economic determinant of conflict in the Liberian wars” (Hegre, Østby, and Raleigh 2009). Conflict intensity rises as the wealth and relative wealth in an area increases. “This corresponds to Duyvesteyn’s account (2005), which focuses on the wealth of Liberia as motivation for fighting during the war” (Hegre, Østby, and Raleigh 2009).

In the particular case of Liberia, the “opportunity explanation of armed conflict” explains the location of civil war events best. Civil war events occur primarily in locations that present economic opportunities.

The article “Population Size, Concentration, and Civil War. A Geographically Disaggregated Analysis” by Håvard Hegre and Clionadh Raleigh was published in 2000. “The most robust empirical finding in country-level studies of civil war is that large countries more frequently have civil war than small countries” (Raleigh and Hegre 2009). There is a strong correlation between country size and the onset of civil war. However, the reason or causal inference why larger countries experience more civil wars has not been clearly determined. In this article, the researchers employ a disaggregated and sub-state level approach to answer the question.

There have been various “size-related explanations of civil war” (Raleigh and Hegre 2009) in the conflict and civil war literature. The authors include these explanations and attempt to test them empirically. The first explanation is “based on the assumption of a constant and homogenous ‘per-capita conflict propensity’” (Raleigh and Hegre 2009). Individuals have the same propensity or likelihood to engage in a conflict

or civil war. As the population size increases in a location, the likelihood of a conflict breaking rises in the given location.

Another explanation proposes that “the probability of conflict events at a location is likely to be dependent on where the location is situated relative to the capital, a rebel group’s headquarters, and to an international border” (Raleigh and Hegre 2009). There is “an assumption that there are economies of scale in the production of public goods and that the utility individuals derive from the public good decreases with distance” (Raleigh and Hegre 2009). Regions closer to the capital or political center of the country will have better provision of public goods, and regions farther away from the capital will have worse provision of public goods. Peripheral regions have a greater incentive to secede from the country and/or engage in civil war, since the provision of public goods is smaller there. Additionally, it also becomes more difficult for the government to military control remote regions, since “transportation takes longer time and requires better organization, supply lines become more vulnerable to guerilla attacks, and the local population may become more hostile the farther from the capital they are located” (Raleigh and Hegre 2009).

Furthermore, “the risk of civil war events at a location is higher in border regions” (Raleigh and Hegre 2009). Rebel groups, in border regions, have the ability to flee into the neighboring country and find shelter and protection there. Hence, border regions should experience more conflict, since civil war or conflict becomes more advantageous for rebel groups in border regions. Additionally, “the risk of civil war events at a location decreases with the distance from the location to the rebel group’s headquarter” (Raleigh and Hegre 2009).

“The risk of civil war events at a location increases as the size of population in the immediate geographical neighborhood increases” (Raleigh and Hegre 2009). As population density in an area increases, the location frequently becomes more valuable for both rebels and government groups. Hence, these areas naturally become the target of military attacks.

The authors also suggest that “the risk of civil war events at a location increases more strongly in local population concentrations in locations distant from the capital of countries” (Raleigh and Hegre 2009). The key insight here is that “distance from capital and population concentration are factors that are likely to reinforce themselves” (Raleigh and Hegre 2009). Civil war events are most likely in distant regions with greater population density. Lastly, the authors propose that “risk of civil war events at a location varies with the size of the population of the country to which the location belongs, controlling for the local effects” (Raleigh and Hegre 2009).

The researchers employ the Armed Conflict Location Event Dataset (ACLED) to examine the links between population size and the onset of civil war in particular locations.

The dataset consists of 4,145 battle events for the 1960 – 2004 period in Africa. In the present analysis, we use 2,530 of these. The remaining events were dropped either because they were in countries not included in the analysis, or because information was missing for one of the key variables. (Raleigh and Hegre 2009)

It is crucial to note that the authors do not distinguish, or discriminate between the different events classified in the ACLED dataset. The researchers separate the landmass into “smaller portions of 8.6km by 8.6 km” (Raleigh and Hegre 2009), which serve as the unit of analysis.

An important aspect in disaggregated studies is the temporal and spatial dependence between the various units of analysis. A civil war event in a unit of analysis can be both temporally as well as spatially dependent upon other civil war events. The unit of analysis is “not fully independent”, and the “statistical model employed to analyze these data must handle the dependence between observations” (Raleigh and Hegre 2009). The researcher can use a “Cox regression” (Raleigh and Hegre 2009), which controls for the dependency.

Since the unit of analysis is disaggregated, the control and independent variable must necessarily be disaggregated as well. The researchers employ “spatial data” (Raleigh and Hegre 2009) appropriate for a disaggregated approach. The researchers created the following independent variables to examine the possible relationship between populations size and the onset of civil war: “log population in square”, “log population in neighboring squares”, “population growth in square”, “log population in country”, “log area of country”, “distance from capital”, “distance from rebel group headquarters”, “border square”, and an “interaction country-square population” variable (Raleigh and Hegre 2009). The researchers also included the following control variables “road type”, “proximity of event in square”, “proximity of event in neighboring square”, and “distance to most recent previous event” (Raleigh and Hegre 2009).

The result of the study offered some interesting result. “Conflict events tend to have frequencies in proportion to the size of the population in a given” location (Raleigh and Hegre 2009). In other words, as the population areas rises, the potential for conflict rises there as well. Conflict occurs more frequently in populous areas of a country. “However, we also found evidence supporting the hypothesis that conflict happens

predominately where populations cluster locally” (Raleigh and Hegre 2009).

Additionally, the researchers also determine that distance to the capital is not as crucial as estimated in other studies. The researchers go so far as to say that “the picture of African internal conflict as primarily rural events is inexact” (Raleigh and Hegre 2009).

The results still indicate that countries with populations that are largely concentrated around the capital have fewer internal conflict events than countries with populations that are spread out, or, even more strongly, are also concentrated in location far from the capital. (Raleigh and Hegre 2009)

John O’Loughlin in collaboration with several other researchers has contributed heavily to the disaggregated study of conflict and civil war. O’Loughlin and others examined the determinants of violence and conflict (O’Loughlin and Witmer 2011) for the North Caucasus in Russia. The authors report the following: a “strong influence of the Chechen locational factors”, “the importance of the main transport route in the region, the Federal Caucasian Highway”, that “violence is also found disproportionately in non-Russian locations”, and “forest cover” in a location are determinants of conflict and civil war in the North Caucasus(O’Loughlin and Witmer 2011).

O’Loughlin in several of his papers (O’Loughlin, Witmer, and Linke 2010; O’Loughlin and Witmer 2011; O’Loughlin et al. 2010) explores not only the determinants of conflict, violence and civil war, but also identifies spatial and temporal dimensions of conflict. Conflict and civil war change in their temporal intensity, as well as in their spatial location. O’Loughlin highlights these changes, which provide for a greater understanding of the particular mechanisms of conflict and civil war.

O’Loughlin has used spatial and temporal analysis methods, such as “monthly distributions of events”, “geographic distribution of events”, “kernel density of events”, “significant space-time clusters of events” , Moran’s I scores for various time periods

outlining changing spatial autocorrelation, and “mean centers and standard deviational ellipses” to analyze conflict patterns and diffusion of violence (O’Loughlin and Witmer 2011).

To determine “significant space-time clusters of events” (O’Loughlin and Witmer 2011), O’Loughlin and Witmer employed a scan statistics imbedded in the SatScan statistical program. “The space–time permutation scan statistic used here compares the observed number of events in a space–time cylinder to the expected number of events within specific area and time dimensions” (O’Loughlin and Witmer 2011). The space-time permutation scan statistics identifies hot-spots of violence and conflict.

Furthermore, the authors employ Moran’s I index score for different time periods. A Moran’s I index provides information about spatial autocorrelation, measuring the amount of “spatio-temporal diffusion” (O’Loughlin and Witmer 2011) in the data. The Moran’s I varies in different time periods indicating the altering spatial diffusion of conflict and violence throughout the observation period. Similarly, the mean centers and standard deviational employed by O’Loughlin allowed for an examination of spatio-temporal diffusion. The mean center indicates the center of all events in the dataset, for a particular time period, calculated by averaging the longitudinal and latitudinal data. Hence, the mean center provides a geographic center of conflict and violence, enabling a tracking of the spatial center over time. The standard deviational ellipses identify the diffusion of conflict measuring the standard deviation for all conflict events in a given time period. The greater the standard deviational ellipse, the greater the diffusion of conflict is, and vice versa. The standard deviational ellipses and mean centers facilitate a tracking of the spatial aspects of conflict for different temporal periods of conflict.

Conflict and civil war data is not homogenous through time and space, but varies with time and through space. Understanding spatial and temporal variations of conflict and civil war is necessary for a more comprehensive analysis of conflict and civil war.

Disaggregated studies of conflict have identified localized determinants of conflict. Determinants of conflict remain context and location specific with demographic determinants being some of the most robust determinants. Most disaggregated studies of conflict have been undertaken in the African context, and our study will contribute to the disaggregated study of conflict by examining localized determinants of conflict in the context of Haiti, a Caribbean and Central American nation. Furthermore, O'Loughlin has highlighted the importance of assessing spatial and temporal structure and the spatial diffusion of conflict which improved the understanding of conflict dynamics.



Figure 2-1. Political Map of Haiti.

Source: Nations Online Project (Nations Online Project)

## CHAPTER 3 TEMPORAL AND SPATIAL PATTERNS IN THE HAITI ACLED

The ACLED records violent events including temporal and spatial information of the event. The temporal and spatial information of the event provides the researcher with information useful to understand patterns and causal relationship in the underlying data. “Geographers and other scientists are often interested in exploring data that have been gathered over time. Observations on a variable that arranged temporally, or in a time sequence, are called a time series” (Burt, Barber, and Rigby 2009). On the other hand, “spatial data combine observations on a variable of interest with reference to their geographical location” (Burt, Barber, and Rigby 2009). Spatial data provides the researchers with data on spatial locations. Both the temporal and spatial components of the data enable the researchers to further explore the causal structure of conflict. Hence, in this chapter we will explore the temporal and spatial patterns of conflict in Haiti.

### **Temporal Patterns in the Haiti ACLED**

Temporal data “are analyzed to describe, understand or explain, predict, and sometimes even control the underlying process generating the observations in the time series” (Burt, Barber, and Rigby 2009). The temporal aspect of the ACLED allows us “to discover statistical regularities consistent with whatever physical or social processes happen to be operating” (Burt, Barber, and Rigby 2009). The temporal aspect of the data allows the researcher to test for significant trends in the data, which must be considered in the analysis of the data.

The ACLED dataset includes the “time information” (Raleigh, Linke, and Dowd 2012) for every conflict event, which is labeled as event date in the datasets. It records

the time, month, and year, when the event occurred. As long as violent activities continue, the ACLED records an event for every single day. For example,

if a military campaign in an area starts on March 1st, 1999 and lasts until March 5th, 1999 with violent activity reported on each day, then it is coded as five different events in ACLED with a different date for each entry. (Raleigh, Linke, and Dowd 2012)

### **Simple Temporal Frequency Analysis**

The ACLED for Haiti includes 1055 events from 1997 to 2010. Table 3-1 and Figure 3-1 display the events for every individual year in the observation range. The ACLED events are clearly centered in 2003, 2004, and 2005. 17.82% of events occur in 2003, 30.52% of events occur in 2004, and 8.72% of events occur in 2005. Hence, 57.02% of all events occurred throughout a three year time period in the dataset, and this simple temporal analysis points out that political violence had increased significantly then, and underlying social patterns must be considered in order to explain this pattern.

Between 1997 and 2003, the ACLED event count per year ranged from 18 to 83 events per year. For four of the six years, the event count per year ranged between 49 and 57 events per year. Between 2006 and 2010, the ACLED event count per year range from 8 to 42 events per year, and in 2007 only 8 events were recorded, the lowest total event count per year.

Carrol Faubert stated in 2006 in a United Nations Development Report about the security situation in Haiti:

Since the departure of Jean-Claude Duvalier in February 1986, Haiti has been engaged in a seemingly endless political transition punctuated by several military coups, outbursts of violence and foreign military interventions. The case of Haiti cannot be described as a conflict situation. There has been no recent situation of war with a neighboring country, nor has there been a civil war between opposing Haitian factions or communities. Haiti is a case of a lingering political and governance crisis accompanied by a severe degradation of the economy, of security and of

livelihoods. The country has been trapped in an accelerating downward spiral that will be difficult to halt and reverse. (Faubert 2006)

Violence, conflict, and uprising occurred frequently between 1997 and 2000.

Some years, such as 1998, might have seen less violence and political conflict, but the ACLED suggest that throughout the first presidency of Préval political violence and instability existed. In November of 2000, Aristide was elected to become the new president of Haiti. The ACLED indicates a small spike of political violence and conflict. The electoral process, in a country with high political instability and a tenuous security situation, seemed to temporally destabilize Haiti. In 2001 and 2002, political violence and conflict was reduced to the levels prior 2000 again. It was in this time that the opposition against Aristide via the CD and G184 formed and gained in strength.

Beginning in the summer 2001 until the middle of 2003, former Haiti military members staged infrequent paramilitary attacks on Aristide's government (Hallward 2007). Carrol Faubert stated that a "chaotic situation prevailed during most of Aristide's second Presidency" (Faubert 2006). The ACLED event counts for the various year suggest that the security situation in the early years of Aristide's second reign was not markedly different than the late 1990s.

In 2003, the security situation in Haiti rapidly deteriorated. The ACLED observed 188 events for 2003. In 2003, the opposition against President Aristide had gained in force and resolve. "Uncontrolled armed groups such as the 'Armée Cannibale', operating mainly in Gonaïves, or former members of the disbanded army and the President's informal militia – the 'Chimères' – had a free hand in many parts of the country, perpetuating the cycle of violence and impunity" (Faubert 2006). In 2004, President Aristide had been ousted from office, and violence and conflict became

epidemic throughout Haiti. The ACLED recorded 322 events for Haiti that year, which were in part caused by the clashes between various military and paramilitary groups.

In 2005, violence and conflict began to drop in Haiti. Another presidential election was held in 2006, and Rene Prével was elected for his second term as the Haitian president. The ACLED data suggest that political violence and conflict noticeably decreased since the election of Prével. However, Carol Faubert noted that a “shift from politically-motivated violence to purely criminal activities, including kidnappings, drug trafficking, rapes and murders” (Faubert 2006) occurred. Since the ACLED focuses primarily on political conflict and violence, the increase in criminal activities might have not been reported. Overall, experts in Haiti agree that levels of political conflict and violence have decreased since 2006.

### **Exponentially Weighted Moving Average – Statistical Process Control**

Many of the statistical tools employed for temporal surveillance of events were developed “in the field of statistical process control” (Rogerson 2009). Industrial processes need to be controlled to detect shifts in the mean outcome of a process, and “are often monitored so that various process parameters stay within tolerable limits, and manufactured products maintain acceptable quality” (Rogerson 2009). Multiple statistical tools, i.e. control charts, have been developed to test for “small shifts in the mean of a process” (Lucas and Saccucci 1990). Recently, these control charts and statistical tools have also been employed in other disciplines, such as epidemiology or geography, though their purpose to use them has not changed. To analyze the temporal structure of the data, an Exponentially Weighted Moving Average (EWMA) scheme is employed for the monthly event count of Haiti ACLED. The EWMA control scheme detects changes in the mean of a variable of interest.

The EWMA control scheme can be applied to the ACLED. It allows an examination of the temporal trend in the historical data. If the EWMA statistics for the ACLED event count per month exceeded the Upper Control Limit (UCL's), the mean event count per month temporally shifted above the historical mean, which represent a period of greater political violence in Haiti. If the EWMA statistics for the ACLED event count per month falls below the Lower Control Limit (LCL's), the mean event count per month temporally shifted below the historical mean, which represent a decreased period of political violence in Haiti. Hence, the EWMA will inform us of any sustained temporal trends in the data, while disregarding random outliers in the event count per month, and unsustained temporal trends of political violence.

To perform the EWMA chart analysis, the qcc package (Root 2012) for RStudio (RStudio 2012) was employed. The weighting parameter was set to be 0.3, and  $k$  was set to be 3. The mean of the data is 6.478528, and the standard deviation is 4.39979. Table 3-2 shows the ACLED event count for every month, as well as the UCL's, LCL's, and the EWMA statistics for every single month in the ACLED for Haiti.

Since the weighting parameter,  $\lambda = 0.3$  in our analysis, the variance of the EWMA statistic "quickly converges to its asymptotic value" (Lucas, 1990). The LCL converges to 0.933683, and the UCL's converges to 12.02337. If the EWMA statistic falls between 0.933683 and 12.02337, the process is in control. If it the EWMA statistics falls outside that range, the process is out of control. If the EWMA statistic exceeds the UCL's, a temporary shift of the mean occurred, and violence and conflict surpassed the historical average. If the EWMA statistic is lower than the LCL's, a temporary shift of the mean occurred, and violence and conflict are lower than the historical average.

With the help of the `qcc` package (Root 2012) for RStudio (RStudio 2012), Figure 3-2, of the EWMA control scheme was created. 38 observations of 163 observations are outside the limits, or 23.31% of all months fall outside the UCL's or LCL's.

In June and July of 1998, the EWMA statistics drops below the LCL's, indicating a period of lower political conflict and violence. Haiti had just gone through a political transition period; President Aristide had left office in 1997, and was succeeded by his political ally, Rene Préval. The political landscape was dominated by the Lavalas movement, which enjoyed high levels of support throughout Haiti, and in particular with the poor in urban areas.

Until the middle of 2003, no periods when the EWMA statistic exceeded the ULC's or is lower than the LCL's were observed. In 2000, from March to June of that year, slightly increased political violence and conflict occurred, while the presidential election process transpired, with protest and violence against civilians taking place.

As noted earlier, Carrol Faubert stated that a "chaotic situation prevailed during most of Aristide's second Presidency" (Faubert 2006). The ACLED does not confirm such an interpretation of the security situation throughout Aristide presidency; the levels of violence and political conflict had remained similar to the levels experienced under President Préval.

From October 2003 to June 2005, the EWMA statistic exceeds the UCL's indicating a long sustained period of high political violence and conflict. Political violence and conflict actually started to spike up after Cannibal Army leader Metayer was killed in Gonaïves. After the killing of Metayer in September of 2003, the level of political violence and conflict skyrocketed in Haiti. The ACLED had recorded between 0 and 10

per month prior to the killing, for the next couple of months ACLED counts per month rose to be between 40 and 110. The G184 and CD were the political leadership of the movement, whereas former military members, rebel groups, and gangs, such as the Cannibal Army, led the military effort against Aristide, and his allied gangs and pro Aristide HNP forces. In February 2004, Aristide was ousted from his presidency, and left the country. February 2004 was also the most violent and conflict ridden month in the entire observation period; 11.09 percent of all ACLED events occurred in this particular month. Violence and political conflict rapidly fell after the ousting of Aristide from office, but only for a short period of time. In the fall of 2004, violence escalated “in the poorest neighborhoods” (Griffin 2004) of Haiti, where the most avid Aristide supporters were. There were numerous reports of “government-sponsored violence and extra-judicial killings” (Griffin 2004), and “arbitrary arrests and detention of government critics and supporters of the ousted constitutional government and President Aristide’s Lavalas political party” (Griffin 2004).

The battle for political control over Haiti was won in February 2004, but the fight continued until the middle of 2005. Carrol Faubert noted the following:

The despatching of the Multinational Interim Force at the beginning of 2004 and the subsequent deployment of MINUSTAH helped restore a reasonable level of security in most regions of Haiti. The situation was quite different in Port-au-Prince, however, where armed groups continued their activities and took control of whole neighborhoods. By the end of 2005, some neighbourhoods of Port-au-Prince were considered no-go areas for both the national police and the MINUSTAH forces. These areas, known as ‘zones de non-droit’, are the fiefdoms of gang leaders who exercise full control over the population and engage in criminal activities from those havens. Cité Soleil, with its 300,000 people, is the most notorious of these enclaves. (Faubert 2006)

The country had been stabilized by the end of 2005, except in the poorer neighborhoods of the big cities in Haiti, which now were in full control of rebel gangs. In

February 2006, Haiti elected a new president. Surprisingly, former president Rene Préval, who belonged to the Lavalas movement, won the election, while candidates from the Latortue government, G184, and CD were unsuccessful.

The victory of Préval did not destabilize the country again. The ACLED event counts per month, indicating levels of political violence and conflict, remained low throughout the presidency of Préval. The EWMA statistics drops below the LCL's between May 2007 and March 2008, and another time between November 2008 and December 2009. Under President Préval, Haiti saw long periods of sustained low levels of conflict and violence. Préval has the reputation as a conciliator, and in particular the conflict data reported during his second reign as president confirms this reputation.

The EWMA control chart analysis indicates that two distinct periods of conflict and violence were observed in Haiti: from 1997 to September of 2003, and then again from July 2005 to 2010 persistent low intensity political conflict occurred in Haiti with protest, violence, and clashes between armed groups taking place at a frequent basis. The persistent conflict indicates a violentization of the political process.

From September 2003 to June 2005, the conflict situation had changed. At first a full-fledged rebellion, similar to a civil war, broke out throughout Haiti, ending in the ousting of President Aristide. Violence and conflict continued afterward, due to the instability created by the ousting and resistance by various groups opposed to the ousting. Hence, two distinct periods of violence and political conflict exist inside of the Haiti ACLED.

### **Spatial Patterns in the ACLED Event Dataset**

Spatial data “contains locational information as well as attribute information” (Rogerson 2009). Spatial data are data that include geographic information.

Observations are recorded “at different locations and these locations are coded as part of the data” (Rogerson 2009). Spatial data improves our ability to explore research problems and answer pertinent questions by employing it.

The unique aspect of the ACLED is the provision of spatial conflict data. Every recorded event is provided with longitude and latitude information, which means conflict can now be studied at a localized level.

### **Analysis Structure**

Dissaggregated studies of conflict, violence, and civil war have historically employed a grid structure in their research design (Hegre, Østby, and Raleigh 2009; Halvard Buhaug and Rød 2005; Raleigh 2007). The study area, typically several adjacent countries, is divided into a grid of varying sizes.

“The most useful dataset records the events that constitute a conflict at the finest possible level, both spatially and temporally, leaving decisions regarding the appropriate unit of aggregation to the analyst” (Raleigh et al. 2010). For this analysis of conflict, violence and civil war in Haiti, we decided not to employ a grid structure for the analysis. In 2005, Buhaug suggested that “one could think of a research design with the first-order administrative entity as the unit of observation” (Halvard Buhaug and Rød 2005). Buhaug has reservations towards such an approach though, since first-order administrative units are frequently time variant, and have different geographic sizes, which makes analysis more challenging. Most of the disaggregated studies encompass several, neighboring countries with the “function and size of regions varying extensively from country to country” (Halvard Buhaug and Rød 2005).

The goal of this study is to examine conflict, violence, and civil war in Haiti. We decided to employ first-order administrative units as the unit of analysis. Since the focus

of this study is only Haiti, the reservations about size and function variations in first-order administrative units between different countries (Halvard Buhaug and Rød 2005) in a particular research context will not exist in our study design. Furthermore, the demographic variables are provided at the first-order administrative unit, which makes the choice of first-order administrative units logical. Haiti's has ten departments, 41 arrondissements, and 133 communes. The following analysis employs the 133 communes as the unit of analysis.

### **Simple Spatial Analysis**

Using the geo-coordinates of the events, we created several maps outlining the geographic patterns of violence and conflict in Haiti. Using ArcGIS, we counted the number of events in the various communes giving us a count of events for every single commune. We created several frequency maps for different temporal periods and for different types of violence and conflict, which are included in the ACLED.

### **Geographic pattern of conflict and violence in Haiti between 1997 and 2010**

Conflict and political violence in Haiti is clustered in certain communes throughout Haiti, as Figure 3-3 and Table 3-3 shows. The commune Port-au-Prince has 44.36%, Delmas has 12.42%, Gonaïves has 9.86%, and Cap-Haïtien has 3.98% of all conflict events.

The communes encompass some of the largest cities in Haiti. Hence, conflict events occur with great frequency in the large Haitian cities. Conflict, in particular, is clustered in the metropolitan area of Port-au-Prince, which includes the communes of Port-au-Prince, Delmas, Pétion-Ville, and Carrefour.

In 70 communes zero conflict events were recorded and for 26 communes only one event was recorded between 1997 to 2010. Conflict events are clustered in Haiti, and political violence and conflict can be extreme in the population centers of Haiti.

### **Geographic pattern of conflict and violence in Haiti for three distinct time periods**

The EWMA process control suggested that three distinct periods existed in Haiti between 1997 and 2010. Conflict and violence were particularly high between 2003 and 2005. From 2006 to 2010, the EWMA suggested that conflict was at times historically low, and Haiti observed relative political stability. From 1997 to 2002, president Préal and Aristide, both leaders in the Lavalas movement, were in power and average levels of conflict were observed. We decided to examine the geographic pattern of conflict and violence for these three distinct time periods. The objective is to examine, whether or not difference in spatial diffusion between the three time periods exist.

From 1997 to 2002, 314 conflict events occurred, from 2003 to 2005, 602 events occurred, and from 2006 to 2010, 139 events occurred. Conflict and violence, regardless of time period, are clustered in the greater metropolitan area of Port-au-Prince.

For areas in Haiti, difference in the spatial pattern for the different time periods can be observed. Between 1997 and 2002, as noted in Table 3-4 and Figure 3-4, the greater metropolitan area of Port-au-Prince observed 66.24% of the events. Significant levels of conflict also occur in Gonaïves, Saint-Marc, Cap-Haïtien, and Petit-Goâve. Conflict is clustered in the population centers of Haiti in this time period. A vast majority of communes also experience zero events of conflict in this time period.

Between 2003 and 2005, as noted in Table 3-5 and Figure 3-5, the intensity of conflict increased throughout Haiti, and 57.1 percent of all conflict events occur in this

period. Conflict continues to be clustered around the greater metropolitan area of Port-au-Prince. However, conflict intensity rises in the north of Haiti. In Gonaïves 14.78% of all events occurred, and 5.65% events occurred in Cap-Haïtien. The coup d'état against Aristide in 2003 and 2004 began in those two communes, with rebel groups seizing control of both cities before the ousting of President Aristide. The coup d'état was not a local phenomena, solely centered in one part of the country, but conflict existed in most parts of Haiti with many communes at least one zero conflict event.

Between 2006 and 2010, as noted in Table 3-6 and Figure 3-6, the spatial patterns of violence and political violence evolved. Conflict intensity has historically been high in the greater metropolitan area of Port-au-Prince. In those years, the spatial clustering in Port-au-Prince intensified with 78.41percent of all conflict events taking place there. A striking aspect of this time period is the pacification of both Gonaïves and Cap-Haïtien. Both communes had been the epicenter of the rebellion against Aristide in 2003, but now returned to a state of extremely low violence. The rest of the country also returned to a state of political stability with low levels of conflict.

The geographic diffusion of conflict changed between the three time periods. Between 2003 and 2005, conflict and violence was more diffused in Haiti, and conflict intensity had also become high in population centers, such as Gonaïves, Saint-Marc, Cap-Haïtien, and Petit-Goâve. In the periods post and prior to 2003 to 2005, conflict has a more clustered pattern with political conflict remaining stable and relatively high in the greater metropolitan area of Port-au-Prince.

### **Geographic pattern of conflict and violence in Haiti for different event types**

The ACLED recognizes and records eight types of conflict events. "ACLED currently codes for eight types of events, both violent and non- violent, that may occur

during a civil war, instability or state failure” (Raleigh, Linke, and Dowd 2012). Table 3-7 signifies that the ACLED records some of the event types more frequently than others. Battle No Change of Territory, Protest, and Violence Against Civilians combine to account for 92.51% of all recorded events. We created maps for the three most common event types to assess the spatial diffusion of them. The other event types had insufficient number of observations to reliably assess their spatial diffusion.

The spatial diffusion for the three different events appears very comparable, as demonstrated in Figure 3-7, Figure 3-8, Figure 3-9. Conflict and violence are clustered in the major population centers of Haiti with the greater metropolitan area of Port-au-Prince, consisting of the communes of Port-au-Prince, Delmas, Carrefour, and Pétion-Ville, having the highest conflict intensity. In the greater metropolitan area of Port-au-Prince 61.88% of all protest occurs, 88.54% of all violence against civilians occurs, and 67.20% of all battle with no change in territory occurs. Interestingly, the amount of violence against civilians is highly clustered in Port-au-Prince. The exact reason for such significant clustering is not known, but could indicate that violence against civilians is more frequently reported there, or armed groups, such as the police, rebel, or army groups, have a greater propensity for violence directed toward civilians. The spatial diffusion of conflict appears similar throughout Haiti, and no particular distinct difference can be detected with a simple spatial comparison method.

### **Spatial Autocorrelation - Global Moran's I**

“Spatial autocorrelation exists whenever a variable exhibits a regular pattern over space in which its values at a set of locations depends on values of the same variable at other locations” (Burt, Barber, and Rigby 2009). When spatial autocorrelation is positive, “nearby values of a variable are closely related to one another”, (Burt, Barber,

and Rigby 2009) and spatial clustering exists. If spatial autocorrelation is zero on the other hand, the distribution of a variable is random, and no spatial patterns exist. If spatial autocorrelation is negative, “very different values of a variable tend to cluster” (Burt, Barber, and Rigby 2009).

Positive autocorrelation indicates that there is a spatial pattern in the data, and the values of a variable are closely related in space to each other. Such spatial patterns are not random, but a process causes them to occur.

### **Global Moran’s I Methodology**

The global Moran’s I detects spatial autocorrelation in data. In the context of this research, we want to assess the spatial distribution of conflict events in communes in Haiti, so we employed the Global Moran’s I score to assess the spatial autocorrelation. To calculate the Moran’s I score for conflict in Haiti we employ ArcGIS (ESRI 2011a). The number of conflict events in a given commune was the variable of interest. ArcGIS provides several ways to calculate a spatial weight matrix, and the polygon contiguity method to calculate the spatial weight matrix was chosen. With polygon contiguity the spatial weight matrix is solely based upon the values of the variables of the adjacent areas or polygons. Additionally, we decided to utilize row standardization, which is preferred to no standardization, when using a contiguity method.

### **Global Moran’s I Results**

After initially determining that there is spatial clustering of conflict events in Haiti between 1997 and 2010, we tested for spatial autocorrelation using the Global Moran’s I test. The Global Moran’s I score for conflict events in Haiti is 6.980444 (Table 3-11), which is significant at the one percent level. The data exhibits positive spatial

autocorrelation; conflict events are clustered in Haiti, and conflict is more prevalent in certain regions of the country, especially in the greater metropolitan area of Haiti.

Furthermore, significant positive autocorrelation indicates that a spatial pattern exist in the data. Such spatial patterns are not random, but a process causes them to exist. Hence, the spatial autocorrelation indicates that a process influences the occurrence and pattern of conflict in Haiti, and the goal of this research is to uncover the underlying process causing the spatial pattern of violence.

The Haiti ACLED records three event types frequently enough to have them undergo statistical analysis by themselves, whereas other events are recorded too infrequently to be tested. *Battle No Change of Territory, Protest, and Violence Against Civilians* combine to account for 92.51% of all recorded events. We tested the spatial autocorrelation of all three event types. Table 3-12 records the result of the global Moran's I test for each of the event types. The conflict events for all three types of events, namely protest, violence against civilians by an armed groups, and battles between two armed groups, are all significantly spatially clustered at the one-percent confidence level. However, the Moran's I score for the various event types varies. The Moran's I score is 8.065148 for battles between various actors and 7.890661 for violence against civilians, whereas the Moran's I score for protest is only 3.715248. The Moran's I score for protest is substantially lower than for the other two event types, indicating that spatial clustering of protest is not as severe as the spatial clustering of the two other event types.

Conflict diffusion for various event types diverges in Haiti. A possible explanation could lie in a particular distinction between the event types. Protest requires a group of

people with an agenda and sufficient motivation to advocate for a change in social norm, social practice, or in institutional framework. Violence against civilians by an armed group or battle between two armed groups requires an armed group willing to engage in a battle or violent behavior. Protest can easily arise in any part of the country, but violent conflict only occurs when an armed group is present. The difference in spatial clustering might simply be a result of the fact that armed groups are either not present throughout all of Haiti, or find it not necessary to engage in violent conflict throughout Haiti. Benefits of engaging in violent conflict might not exist in some parts of the country or may not be possible, but protest can still occur there. If that is the case, spatial clustering of violent clustering necessarily must be higher.

We also calculated a Moran's I score for different time periods to allow for evaluation of spatial clustering over time. Bailey and Gatrell state that a "reasonable sample sizes" (Bailey and Gatrell 1995) for Moran's I is when the sample size exceeds 25 observations, and the "Moran's I statistic will be approximately normally distributed"(Bailey and Gatrell 1995). Due to low numbers of total events for several years, we decided to combine 1997 and 1998 with each other, 2006, 2007, and 2008 with each other, and also 2009 and 2010 with each other. Figure 3-9 and Table 3-12 illustrate the development of the Moran's I statistic over time. From 1997 to 2000, the clustering of conflict events intensified in Haiti from an already significant level. The peak of spatial clustering occurred in 2000. The Moran's I score then fell from 10.87464 in 2000 to 5.45333 in 2002, which is primarily caused by conflict intensity rising throughout Haiti. Interestingly, from 2000 to 2002 opposition to President Aristide was strengthening, gaining in organizational capacity and vigor in their effort to topple

Aristide. In September 2003, the opposition toward Aristide broke out into a fully fledged rebel movement with paramilitary and gangs operating throughout Haiti, while gaining control of several cities in the north of Haiti. The global Moran's I core fell to 1.11851, which is not significant at the five percent level. Conflict events in communes no longer exhibited a pattern of spatial autocorrelation in 2003. So why did conflict diffuse throughout the rebel movement against President Aristide? The capital often represents the center of power for the government. The power of the government frequently diminishes with distance from the capital, since it becomes more challenging to militarily and/or politically control areas further away from the capital. Hence, a rebel movement has a greater probability of succeeding in regions in the country farther away from the capital. Conflict spread through Haiti most likely in 2003 because initiating a rebel movement had the greatest probability of success in areas other than Port-au-Prince. President Aristide was ousted from office in 2004, and spatial clustering of conflict started to rise again. Conflicts have remained spatially clustered, since 2004. In general, conflict events in Haiti have tended to be significantly clustered. The rebellion against Aristide bucked that trend. In 2003, conflict was diffused throughout Haiti.

### **Local Moran's I Methodology**

We employed ArcGis (ESRI 2011a) to detect local spatial cluster for conflict events in Haiti. ArcGis allows the weight matrix, in other words the conceptualization of the spatial relationships between areas, to be determined in several different ways. We employed the inverse distance weight method with a maximum distance of 63 kilometers. Only features of less kilometer than 63 kilometer will be used to calculate the local Moran's I score for a given feature, and nearby features will impact local

Moran's I to a greater degree. Furthermore, we also employed row standardization, as recommended by Anselin (Anselin 1995).

The local Moran's I, shown in Figure 3-11, indicates that the greater metropolitan area of Port-au-Prince has increased levels of conflict and violence. The LISA has significant positive Z-Scores for the communes of Port-au-Prince, Delmas, and Pétion-Ville; all three communes are part of the greater metropolitan area of Port-au-Prince. Port-au-Prince is the economic, social, and political center of Haiti, and most conflict is centered there as well.

Furthermore, the LISA indicates that the commune of Gonaïves is a spatial outlier. The communes surrounding Gonaïves have a low conflict intensity, whereas in Gonaïves 9.86 percent of total conflict occurred. The LISA points out that Gonaïves is an area with high conflict in a region with low surrounding conflict, in that sense Gonaïves is considered to be a spatial outlier. Surprisingly, the Local Moran's I does not identify Cap-Haïtien as a spatial outlier, a commune with a high event count surrounded by communes with relatively low conflict events.

The Local Moran's I indicates that conflict and conflict events are centered in the greater metropolitan area of Port-au-Prince, with Gonaïves having been a commune of greater conflict intensity as well.

### **Mean Center and Standard Deviational Ellipse**

In combination, the mean and the standard deviational ellipses enable an analysis of the spatial diffusion of conflict in Haiti. O'Loughlin and Witmer had first employed the use of mean center and standard deviational ellipse in their analysis of conflict in the North Caucasus (O'Loughlin and Witmer 2011), and it will serve as an important tool to analyze conflict patterns in Haiti.

Employing ArcGIS, we calculated both the mean center of the data and the standard deviational ellipse for various time periods to assess variations in the spatial diffusion of conflict data (Figure 3-12). Conflict and violence is centered and primarily located in and around Port-au-Prince in 1999, 2000, and 2001. In 2002, the mean center shifted north indicating that political violence and conflict intensity rose in the north of Haiti. The mean conflict continued to shift northward in 2003; in the fall of that year an open rebellion against President Aristide broke out, and rebel forces were particularly active in Gonaïves and Cap-Haïtien. At the end of 2003, rebel forces, gangs, and former military members controlled the north of Haiti, and started to move towards Port-au-Prince with the explicit goal of gaining political power and ousting President Aristide. In 2004, the trend of northward shifting political conflict and violent was reversed as the mean center of conflict shift to the south again. Early in the year, the rebel movement had been so successful militarily that President Aristide fled Haiti, and relinquished his presidency. Conflict intensity shifted southward again. In 2005, the mean center of conflict and political violence was located in Port-au-Prince, just as it had been in years prior to 2002. Overall, the mean center of conflict has remained fairly stable over the years, being in close proximity to Port-au-Prince, and thus indicating that conflict intensity is greatest there. However, a geographical diffusion of conflict occurred in 2002, and intensified in 2003. In 2004, conflict shifted southward then. A rebellion against a government frequently is initiated in parts of the country that are farther away from the capital. As the rebel movement gained in strength, the southward move toward the political power center of Port-au-Prince occurred. The rebellion against the reign of Aristide shifted the spatial pattern of conflict in Haiti. The spatial pattern of this period is

markedly different from the years prior and post. Since 2005, conflict was centered in and around Port-au-Prince again.

From 1999 to 2001, the standard deviational ellipses indicate that conflict intensity was limited in the north of Haiti; the northward extension of the standard deviational ellipses was small in this time period. In 2000, political violence and conflict was slightly elevated in the south-western part of Haiti, in particular in Anse-d'Hainault, stretching the standard deviational ellipses in the west-east direction. Conflict were centered and located geographically in the south of Haiti.

In 2002, conflict intensified in the north of Haiti, in cities such as Saint-Marc, Gonaïves, and Cap-Haïtien. Figure 3-13 illustrates the change in the north-south direction in kilometers over time. Conflict intensity remains high in Port-au-Prince over time, but intensified throughout Haiti, and the overall spatial pattern of conflict changed. Figure 3-13 illustrate the diffusion, and prevalence of conflict in the north, as distance rises, conflict intensity increases in the north of Haiti. In 2000, the north-south distance of standard deviational ellipses was 29.44 kilometers, and increased in 2003 to 76.68 kilometers. The standard deviational ellipses clearly indicate the significant spread of violence and conflict toward the north of Haiti, as the opposition movement against Aristide intensified and rebel activity strengthened in resolve.

Buhaugh had previously argued that “the capability of a country, its “national strength,” is largest at its home base and declines as the nation moves away” (H. Buhaug 2010). President Aristide enjoyed large support in the capital of Haiti, where the Lavalas was strong and Chimères gang supported him. The political and military strength was high in Port-au-Prince for President Aristide, whereas political and military

strength throughout Haiti remained more tenuous and uncertain. The rebellion and civil war was initiated in Gonaïve and Cap-Haïtien, which confirms the theory that outbreaks of conflict and civil war occur in more remote regions from the capital.

The small geographical extent of the standard deviational ellipses in 2005 indicates that the pattern of spatial diffusion was altered in 2005. In 2005, the Minustah troops had been in Haiti for over a year, and pro-Aristide groups had been demilitarized or defeated throughout Haiti. Conflict intensity remained high throughout Port-au-Prince, but the standard deviational ellipse for 2005 indicates the significant pacification of the rest of Haiti. It is not surprising that conflict intensity remained high in Port-au-Prince, since popular support for President Aristide had been high there. Port-au-Prince represents the political power base for Aristide, and the pacification of Port-au-Prince was not as easily accomplished. The standard deviational ellipse for 2006 to 2008 had a substantial west-east direction, since protest and conflict was high in Les Cayes, which is in the south-western part of Haiti.

Additionally, we also calculated the mean center and standard deviational ellipse for different types of events, namely for battles between two armed groups with no territorial change, protest of a group, and violence of an armed group against civilians. Figure 3-14 represents the spatial diffusion for the different types of conflict.

The mean centers for all the different conflict types are in close proximity to each other. The distance between the mean center for battles no change of territory and violence against civilians is 6.67 kilometers, the distance between protest and violence against civilians is 5.30 kilometers, and the distance between violence against civilians is just 1.70 kilometer. The center of conflict for the various event types is similar.

Furthermore, the standard deviational ellipses for the event types do not vary significantly from each other.

The Global Moran's I score indicates that the spatial pattern of protest was different from the other two event types, and was slightly more diffused. The standard deviational ellipses and mean center approach does not suggest that a significant difference between event types exists.

Table 3-1. Simple temporal frequency analysis of Haiti ACLED

Year	Number of Events	Percent of Total Events
1997	55	5.21%
1998	18	1.71%
1999	57	5.40%
2000	83	7.87%
2001	52	4.93%
2002	49	4.64%
2003	188	17.82%
2004	322	30.54%
2005	92	8.72%
2006	23	2.18%
2007	8	0.76%
2008	27	2.56%
2009	39	3.70%
2010	42	3.98%
Total	1055	100.00%

Note: Percent of total events is calculated by dividing the number of events per year by the amount of total events in the observation period.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-2. EWMA statistic for Haiti ACLED

Month	Event Count	EWMA Statistic	LCL	UCL
Jan-97	5	6.034969325	2.518717	10.43834
Feb-97	10	7.224478528	1.644962	11.31209
Mar-97	14	9.257134969	1.270059	11.687
Apr-97	7	8.579994479	1.09588	11.86118
May-97	3	6.905996135	1.012558	11.9445
Jun-97	2	5.434197294	0.972191	11.98486
Jul-97	3	4.703938106	0.952519	12.00454
Aug-97	4	4.492756674	0.942905	12.01415
Sep-97	2	3.744929672	0.9382	12.01886
Oct-97	1	2.92145077	0.935896	12.02116
Nov-97	2	2.645015539	0.934767	12.02229
Dec-97	2	2.451510877	0.934214	12.02284
Jan-98	2	2.316057614	0.933944	12.02311
Feb-98	1	1.92124033	0.933811	12.02324
Mar-98	3	2.244868231	0.933746	12.02331
Apr-98	1	1.871407762	0.933714	12.02334
May-98	0	1.309985433	0.933698	12.02336
Jun-98	0	0.916989803	0.933691	12.02336
Jul-98	0	0.641892862	0.933687	12.02337
Aug-98	4	1.649325004	0.933685	12.02337
Sep-98	2	1.754527503	0.933684	12.02337
Oct-98	1	1.528169252	0.933684	12.02337
Nov-98	2	1.669718476	0.933684	12.02337
Dec-98	2	1.768802933	0.933683	12.02337
Jan-99	4	2.438162053	0.933683	12.02337
Feb-99	3	2.606713437	0.933683	12.02337
Mar-99	7	3.924699406	0.933683	12.02337
Apr-99	10	5.747289584	0.933683	12.02337
May-99	11	7.323102709	0.933683	12.02337
Jun-99	8	7.526171896	0.933683	12.02337
Jul-99	1	5.568320327	0.933683	12.02337
Aug-99	3	4.797824229	0.933683	12.02337
Sep-99	5	4.85847696	0.933683	12.02337
Oct-99	3	4.300933872	0.933683	12.02337
Nov-99	1	3.310653711	0.933683	12.02337
Dec-99	1	2.617457597	0.933683	12.02337
Jan-00	3	2.732220318	0.933683	12.02337
Feb-00	6	3.712554223	0.933683	12.02337
Mar-00	11	5.898787956	0.933683	12.02337
Apr-00	8	6.529151569	0.933683	12.02337
May-00	15	9.070406098	0.933683	12.02337
Jun-00	11	9.649284269	0.933683	12.02337

Table 3-2. Continued

Month	Event Count	EWMA Statistic	LCL	UCL
Jul-00	6	8.554498988	0.933683	12.02337
Aug-00	5	7.488149292	0.933683	12.02337
Sep-00	1	5.541704504	0.933683	12.02337
Oct-00	2	4.479193153	0.933683	12.02337
Nov-00	12	6.735435207	0.933683	12.02337
Dec-00	3	5.614804645	0.933683	12.02337
Jan-01	2	4.530363251	0.933683	12.02337
Feb-01	1	3.471254276	0.933683	12.02337
Mar-01	4	3.629877993	0.933683	12.02337
Apr-01	2	3.140914595	0.933683	12.02337
May-01	0	2.198640217	0.933683	12.02337
Jun-01	6	3.339048152	0.933683	12.02337
Jul-01	1	2.637333706	0.933683	12.02337
Aug-01	3	2.746133594	0.933683	12.02337
Sep-01	0	1.922293516	0.933683	12.02337
Oct-01	4	2.545605461	0.933683	12.02337
Nov-01	8	4.181923823	0.933683	12.02337
Dec-01	21	9.227346676	0.933683	12.02337
Jan-02	2	7.059142673	0.933683	12.02337
Feb-02	2	5.541399871	0.933683	12.02337
Mar-02	0	3.87897991	0.933683	12.02337
Apr-02	2	3.315285937	0.933683	12.02337
May-02	6	4.120700156	0.933683	12.02337
Jun-02	2	3.484490109	0.933683	12.02337
Jul-02	1	2.739143076	0.933683	12.02337
Aug-02	4	3.117400153	0.933683	12.02337
Sep-02	8	4.582180107	0.933683	12.02337
Oct-02	1	3.507526075	0.933683	12.02337
Nov-02	11	5.755268253	0.933683	12.02337
Dec-02	10	7.028687777	0.933683	12.02337
Jan-03	10	7.920081444	0.933683	12.02337
Feb-03	10	8.544057011	0.933683	12.02337
Mar-03	0	5.980839907	0.933683	12.02337
Apr-03	3	5.086587935	0.933683	12.02337
May-03	1	3.860611555	0.933683	12.02337
Jun-03	1	3.002428088	0.933683	12.02337
Jul-03	2	2.701699662	0.933683	12.02337
Aug-03	7	3.991189763	0.933683	12.02337
Sep-03	22	9.393832834	0.933683	12.02337
Oct-03	45	20.07568298	0.933683	12.02337
Nov-03	34	24.25297809	0.933683	12.02337
Dec-03	53	32.87708466	0.933683	12.02337

Table 3-2. Continued

Month	Event Count	EWMA Statistic	LCL	UCL
Jan-04	70	44.01395926	0.933683	12.02337
Feb-04	117	65.90977148	0.933683	12.02337
Mar-04	31	55.43684004	0.933683	12.02337
Apr-04	3	39.70578803	0.933683	12.02337
May-04	8	30.19405162	0.933683	12.02337
Jun-04	1	21.43583613	0.933683	12.02337
Jul-04	6	16.80508529	0.933683	12.02337
Aug-04	4	12.96355971	0.933683	12.02337
Sep-04	15	13.57449179	0.933683	12.02337
Oct-04	33	19.40214426	0.933683	12.02337
Nov-04	14	17.78150098	0.933683	12.02337
Dec-04	20	18.44705069	0.933683	12.02337
Jan-05	4	14.11293548	0.933683	12.02337
Feb-05	14	14.07905484	0.933683	12.02337
Mar-05	16	14.65533839	0.933683	12.02337
Apr-05	10	13.25873687	0.933683	12.02337
May-05	10	12.28111581	0.933683	12.02337
Jun-05	12	12.19678107	0.933683	12.02337
Jul-05	8	10.93774675	0.933683	12.02337
Aug-05	10	10.65642272	0.933683	12.02337
Sep-05	0	7.459495906	0.933683	12.02337
Oct-05	3	6.121647134	0.933683	12.02337
Nov-05	0	4.285152994	0.933683	12.02337
Dec-05	5	4.499607096	0.933683	12.02337
Jan-06	2	3.749724967	0.933683	12.02337
Feb-06	3	3.524807477	0.933683	12.02337
Mar-06	0	2.467365234	0.933683	12.02337
Apr-06	3	2.627155664	0.933683	12.02337
May-06	0	1.839008965	0.933683	12.02337
Jun-06	2	1.887306275	0.933683	12.02337
Jul-06	6	3.121114393	0.933683	12.02337
Aug-06	0	2.184780075	0.933683	12.02337
Sep-06	0	1.529346052	0.933683	12.02337
Oct-06	4	2.270542237	0.933683	12.02337
Nov-06	1	1.889379566	0.933683	12.02337
Dec-06	3	2.222565696	0.933683	12.02337
Jan-07	3	2.455795987	0.933683	12.02337
Feb-07	1	2.019057191	0.933683	12.02337
Mar-07	0	1.413340034	0.933683	12.02337
Apr-07	0	0.989338024	0.933683	12.02337
May-07	0	0.692536617	0.933683	12.02337
Jun-07	1	0.784775632	0.933683	12.02337

Table 3-2. Continued

Month	Event Count	EWMA Statistic	LCL	UCL
Jul-07	1	0.849342942	0.933683	12.02337
Aug-07	0	0.594540059	0.933683	12.02337
Sep-07	0	0.416178042	0.933683	12.02337
Oct-07	1	0.591324629	0.933683	12.02337
Nov-07	1	0.71392724	0.933683	12.02337
Dec-07	0	0.499749068	0.933683	12.02337
Jan-08	0	0.349824348	0.933683	12.02337
Feb-08	1	0.544877043	0.933683	12.02337
Mar-08	1	0.68141393	0.933683	12.02337
Apr-08	22	7.076989751	0.933683	12.02337
May-08	0	4.953892826	0.933683	12.02337
Jun-08	1	3.767724978	0.933683	12.02337
Jul-08	2	3.237407485	0.933683	12.02337
Aug-08	0	2.266185239	0.933683	12.02337
Sep-08	0	1.586329667	0.933683	12.02337
Oct-08	0	1.110430767	0.933683	12.02337
Nov-08	0	0.777301537	0.933683	12.02337
Dec-08	0	0.544111076	0.933683	12.02337
Jan-09	0	0.380877753	0.933683	12.02337
Feb-09	1	0.566614427	0.933683	12.02337
Mar-09	2	0.996630099	0.933683	12.02337
Apr-09	3	1.597641069	0.933683	12.02337
May-09	3	2.018348749	0.933683	12.02337
Jun-09	22	8.012844124	0.933683	12.02337
Jul-09	0	5.608990887	0.933683	12.02337
Aug-09	2	4.526293621	0.933683	12.02337
Sep-09	4	4.368405535	0.933683	12.02337
Oct-09	0	3.057883874	0.933683	12.02337
Nov-09	0	2.140518712	0.933683	12.02337
Dec-09	2	2.098363098	0.933683	12.02337
Jan-10	15	5.968854169	0.933683	12.02337
Feb-10	10	7.178197918	0.933683	12.02337
Mar-10	5	6.524738543	0.933683	12.02337
Apr-10	3	5.46731698	0.933683	12.02337
May-10	5	5.327121886	0.933683	12.02337
Jun-10	3	4.62898532	0.933683	12.02337
Jul-10	1	3.540289724	0.933683	12.02337

Note: Event count indicates the number of ACLED event per month. EWMA statistic represents the exponentially weighted moving average statistics for each month. Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-3. ACLED event count for communes in Haiti between 1997 and 2010

Commune	Event Count	Percent of Total Event
Port-au-Prince	468	44.36%
Delmas	131	12.42%
Gonaïves	104	9.86%
Cap-Haïtien	42	3.98%
Saint-Marc	38	3.60%
Pétion-Ville	36	3.41%
Petit-Goâve	35	3.32%
Cayes	18	1.71%
Hinche	15	1.42%
Carrefour	13	1.23%
Belladère	11	1.04%
Mirebalais	11	1.04%
Ounaminthe	10	0.95%
Jacmel	10	0.95%
Jérémie	7	0.66%
Croix-des Bouquets	7	0.66%
Grand-Goâve	7	0.66%
Ennery	6	0.57%
Miragoâne	6	0.57%

Note: Communes with less than 0.50 percent of total events have been excluded in this table.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-4. ACLED event count for communes in Haiti between 1997 and 2002

Commune	Event Count	Percent of Total Event
Port-au-Prince	147	46.82%
Delmas	42	13.38%
Petit-Goâve	19	6.05%
Pétion-Ville	19	6.05%
Gonaïves	15	4.78%
Saint-Marc	10	3.18%
Cap-Haïtien	8	2.55%
Carrefour	8	2.55%
Belladère	6	1.91%
Croix-des Bouquets	4	1.27%
Hinche	3	0.96%
Anse d'Hainaul	3	0.96%
Cabaret	3	0.96%
Jacmel	3	0.96%
Mirebalais	2	0.64%
Jérémie	2	0.64%
Ounaminthe	2	0.64%
Grand-Goâve	2	0.64%
Léogâne	2	0.64%
Cayes	2	0.64%

Note: Communes with less than 0.50 percent of total events have been excluded in this table.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-5. ACLED event count for communes in Haiti between 2003 and 2005

Commune	Event Count	Percent of Total Event
Port-au-Prince	244	40.53%
Gonaïves	89	14.78%
Delmas	61	10.13%
Cap-Haïtien	34	5.65%
Saint-Marc	28	4.65%
Petit-Goâve	16	2.66%
Pétion-Ville	15	2.49%
Hinche	11	1.83%
Mirebalais	8	1.33%
Ounaminthe	7	1.16%
Ennery	6	1.00%
Miragoâne	6	1.00%
Jacmel	6	1.00%
Belladère	5	0.83%
Grand-Goâve	5	0.83%
Jérémie	4	0.66%
Trou du Nord	4	0.66%
Port-de-Paix	4	0.66%
Dondon	4	0.66%
Anse-à-Galets	4	0.66%
Maïssade	3	0.50%
Croix-des Bouquets	3	0.50%
Ganthier	3	0.50%
Carrefour	3	0.50%

Note: Communes with less than 0.50 percent of total events have been excluded in this table.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-6. ACLED event count for communes in Haiti between 2006 and 2010

Commune	Event Count	Percent of Total Event
Port-au-Prince	77	55.40%
Delmas	28	20.14%
Cayes	14	10.07%
Pestel	2	1.44%
Gros-Morne	2	1.44%
Carrefour	2	1.44%
Pétion-Ville	2	1.44%
Hinche	1	0.72%
Lascahobas	1	0.72%
Mirebalais	1	0.72%
Jérémie	1	0.72%
Verettes	1	0.72%
Baraderes	1	0.72%
Ounaminthe	1	0.72%
Acul du Nord	1	0.72%
Limbé	1	0.72%
Saint-Saint-Raphaël	1	0.72%
Léogâne	1	0.72%
Jacmel	1	0.72%

Note: Communes with less than 0.50 percent of total events have been excluded in this table.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-7. ACLED event type distribution

Event Type	Event Count	Percent of Total Event
Battle Government Regains Territory	7	0.66%
Battle No Change of Territory	253	23.98%
Battle Rebels Gain Territory	25	2.37%
Headquarter / Basecamp	1	0.09%
Nonviolent Rebel Activity	32	3.03%
Nonviolent Transfer Territory	14	1.33%
Protest	389	36.87%
Violence Against Civilians	334	31.66%

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-8. Spatial diffusion of protest in Haiti

Commune	Event Count	Percent of Total Event
Port-au-Prince	202	51.93%
Gonaïves	47	12.08%
Cap-Haïtien	19	4.88%
Delmas	19	4.88%
Saint-Marc	16	4.11%
Petit-Goâve	15	3.86%
Pétion-Ville	14	3.60%
Cayes	10	2.57%
Jacmel	6	1.54%
Hinche	5	1.29%
Anse-à-Galets	5	1.29%
Grand-Goâve	4	1.03%
Jérémie	3	0.77%
Ganthier	3	0.77%
Carrefour	3	0.77%
Ennery	2	0.51%
Miragoâne	2	0.51%
Ounaminthe	2	0.51%
Cabaret	2	0.51%
Léogâne	2	0.51%

Note: Communes with less than 0.50 percent of total events have been excluded in this table.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-9. Spatial diffusion of violence against civilians in Haiti

Commune	Event Count	Percent of Total Event
Port-au-Prince	165	65.22%
Delmas	38	15.02%
Gonaïves	27	10.67%
Cap-Haïtien	15	5.93%
Pétion-Ville	14	5.53%
Petit-Goâve	10	3.95%
Saint-Marc	9	3.56%
Carrefour	7	2.77%
Hinche	5	1.98%
Belladère	5	1.98%
Croix-des Bouquets	4	1.58%
Jacmel	4	1.58%
Cayes	4	1.58%
Ounaminthe	3	1.19%
Miragoâne	2	0.79%
Jean-Rabel	2	0.79%
Port-de-Paix	2	0.79%
Léogâne	2	0.79%

Note: Communes with less than 0.50 percent of total events have been excluded in this table.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-10. Spatial diffusion of battles with no change of territory in Haiti

Commune	Event Count	Percent of Total Event
Port-au-Prince	90	35.57%
Delmas	70	27.67%
Gonaïves	25	9.88%
Petit-Goâve	7	2.77%
Pétion-Ville	7	2.77%
Saint-Marc	6	2.37%
Cap-Haïtien	4	1.58%
Hinche	3	1.19%
Belladère	3	1.19%
Lascahobas	3	1.19%
Mirebalais	3	1.19%
Croix-des Bouquets	3	1.19%
Carrefour	3	1.19%
Cayes	3	1.19%
Miragoâne	2	0.79%

Note: Communes with less than 0.50 percent of total events have been excluded in this table.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-11. Global Moran's I score for conflict in Haiti

Moran's I Score	Expected Moran's I	Z-score	P-Value
0.203949	-0.007576	6.980444	0.00000

Note: = Z-score of 1.96 indicates significant clustering at the five percent confidence level.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-12. Global Moran's I score for types of conflict events in Haiti

Event Type	Moran's I Score	Expected Moran's I	Z-score	P-Value
Battle No Change of Territory	0.353833	-0.007576	8.065148	0.00000
Protest	0.083154	-0.007576	3.715248	0.00020
Violence Against Civilian	0.196605	-0.007576	7.890661	0.00000

Note: = Z-score of 1.96 indicates significant clustering at the five percent confidence level.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 3-13. Global Moran's I for various time periods

Year	Number of Events	Moran's I Score	Expected Moran's I Score	Z-score	P-Value
1997 - 1998	73	0.14440	-0.0076	6.27276	0.00000
1999	57	0.12154	-0.0076	9.25688	0.00000
2000	83	0.277577	-0.0076	10.87464	0.00000
2001	52	0.32935	-0.0076	6.44471	0.00000
2002	49	0.27651	-0.0076	5.45333	0.00000
2003	188	0.04453	-0.0076	1.11851	0.26335
2004	322	0.14651	-0.0076	4.95860	0.00000
2005	92	0.25965	-0.0076	7.69937	0.00000
2006 - 2008	58	0.28282	-0.0076	6.03969	0.00000
2009 - 2010	81	0.09853	-0.0076	8.48079	0.00000

Note: = Z-score of 1.96 indicates significant clustering at the five percent confidence level.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

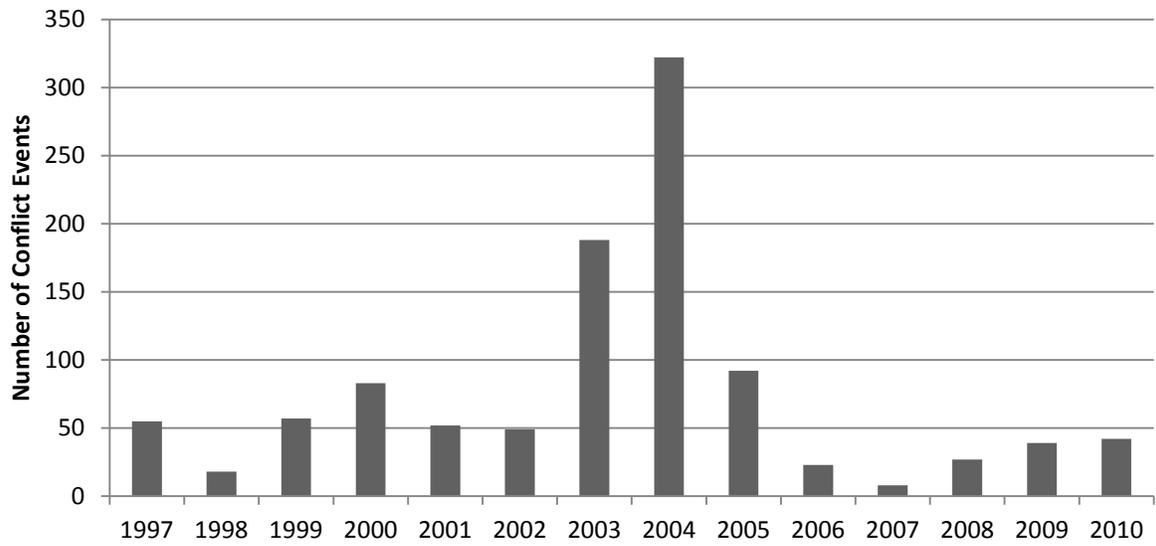


Figure 3-1. Temporal frequency chart for Haiti Armed Conflict Location and Event Dataset between 1997 and 2010.

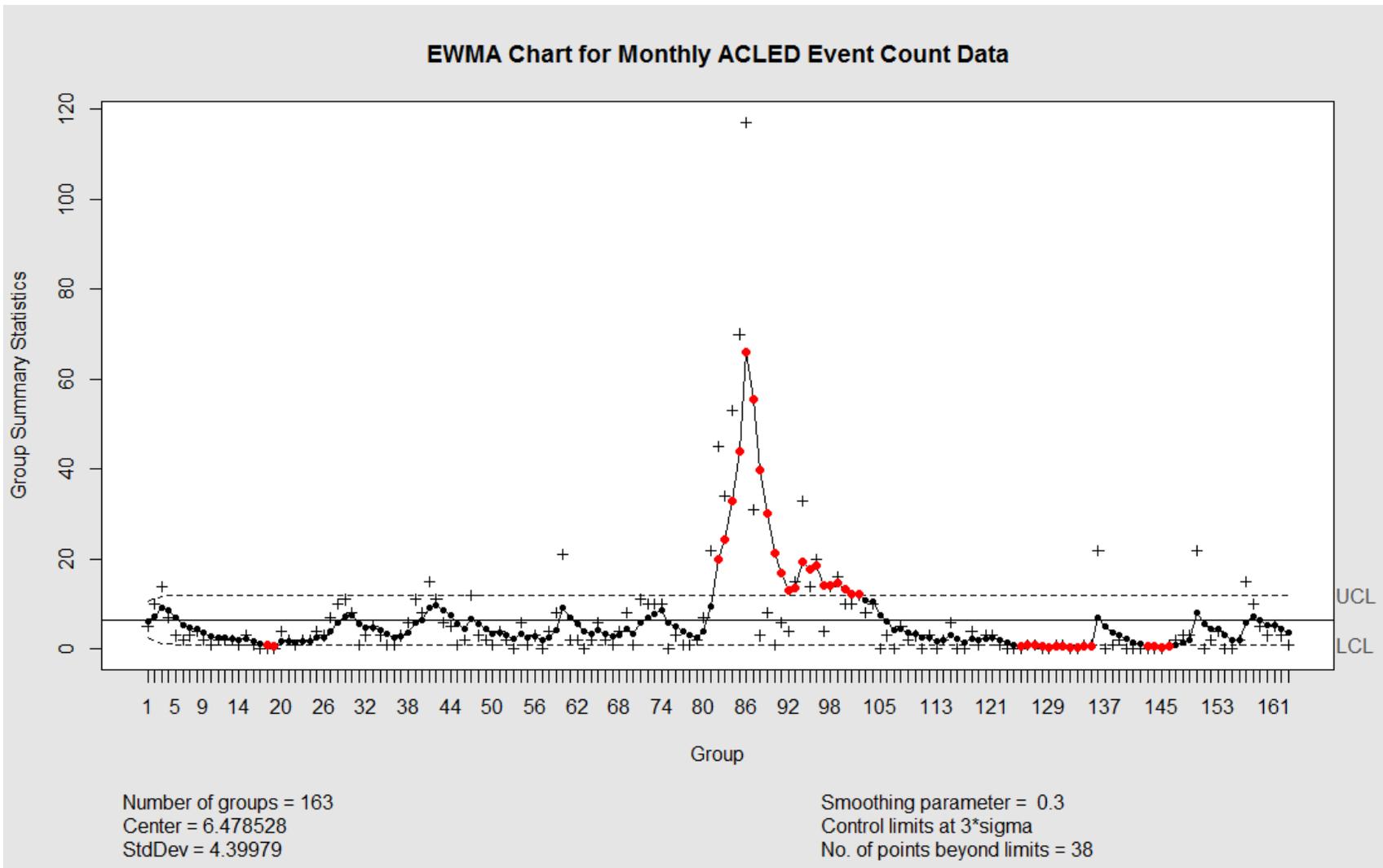


Figure 3-2. EWMA chart for monthly Haiti ACLED event data.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

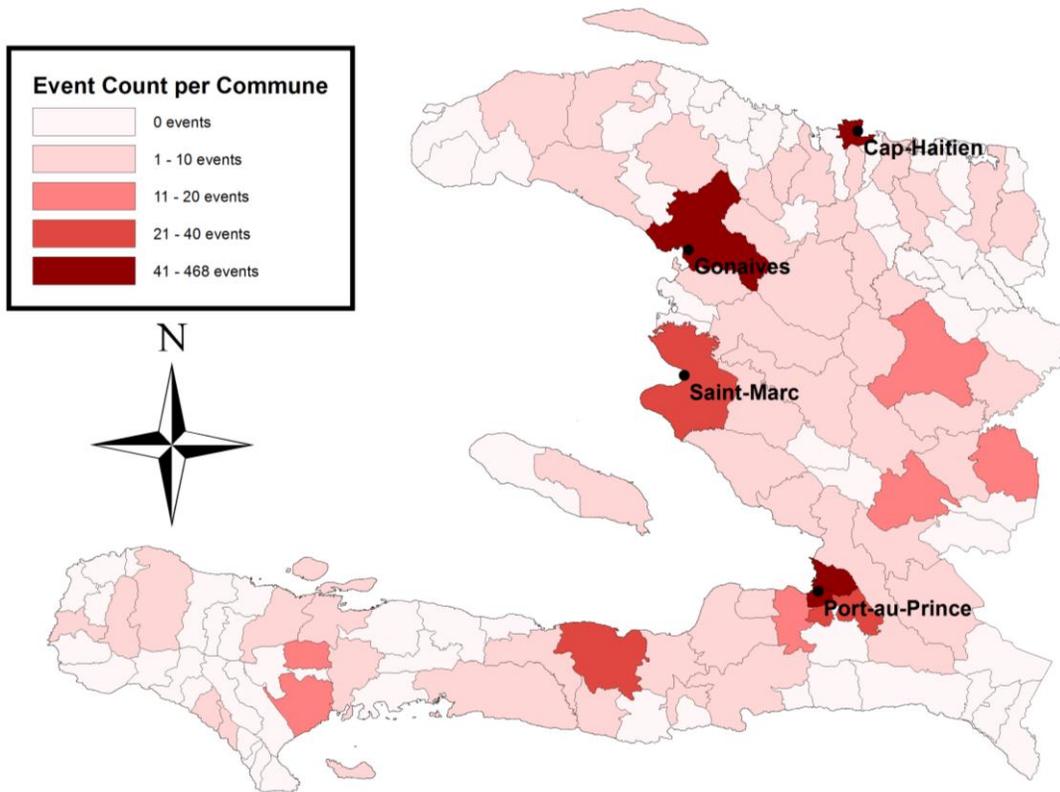


Figure 3-3. ACLED event count for the 133 communes between 1997 and 2010.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

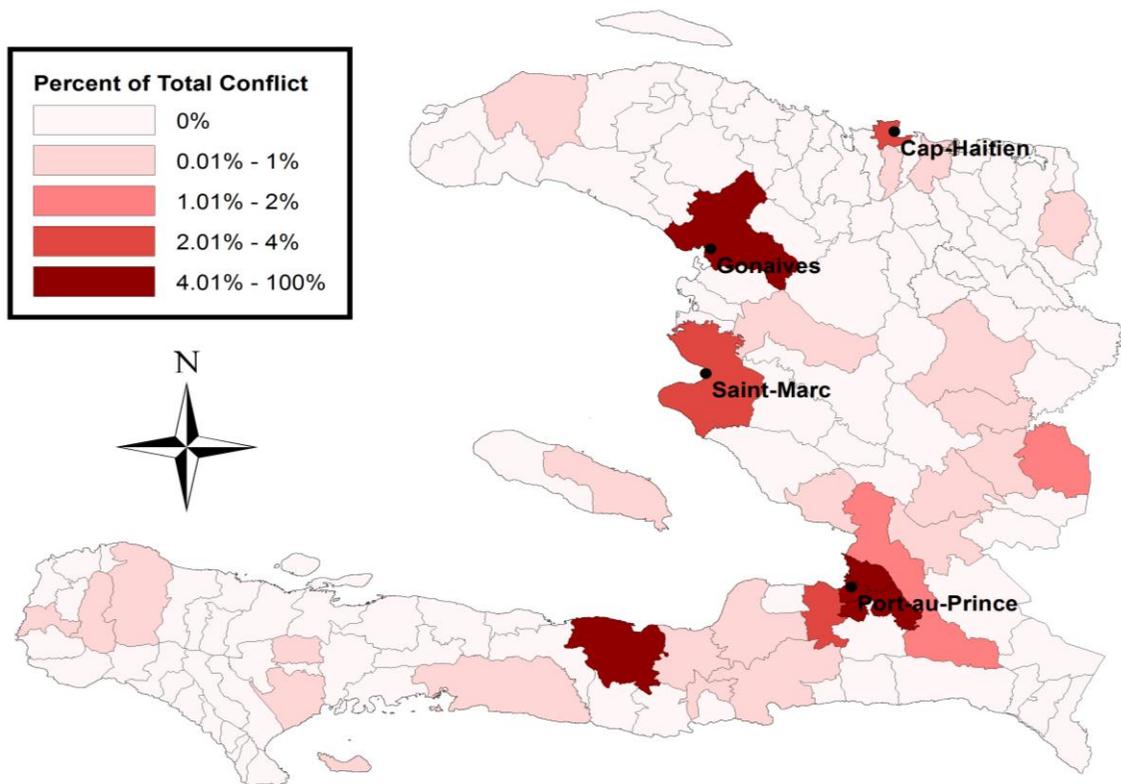


Figure 3-4. Percentage of total events for the 133 communes between 1997 and 2002.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

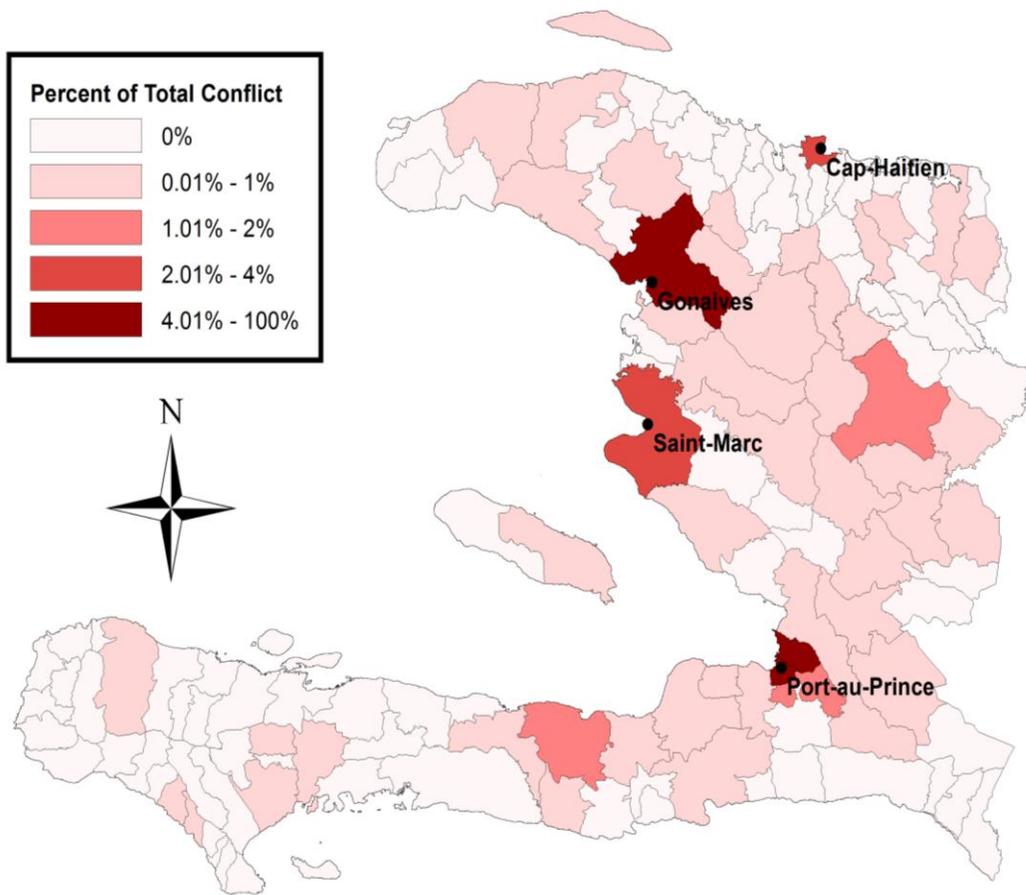


Figure 3-5. Percentage of total events for the 133 communes between 2003 and 2005.  
 Source: User creation using Haiti ACLED (Raleigh et al. 2010).

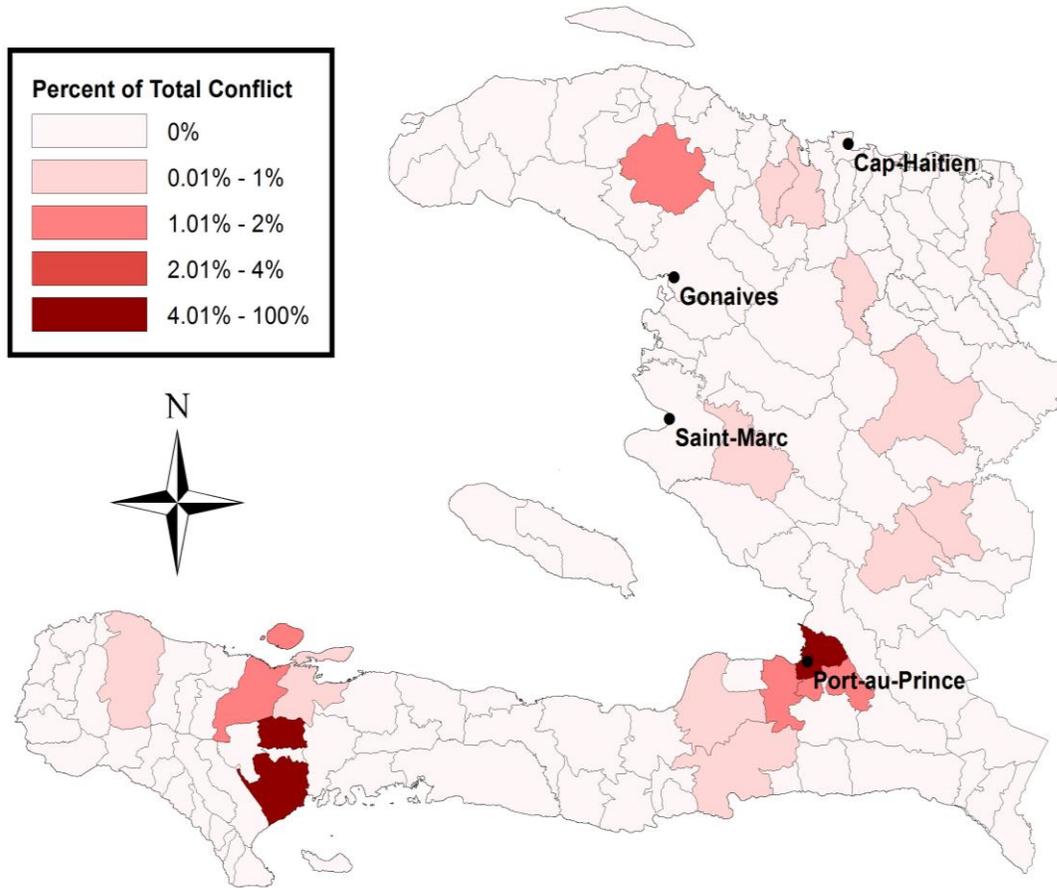


Figure 3-6. Percentage of total events for the 133 communes between 2006 and 2010.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

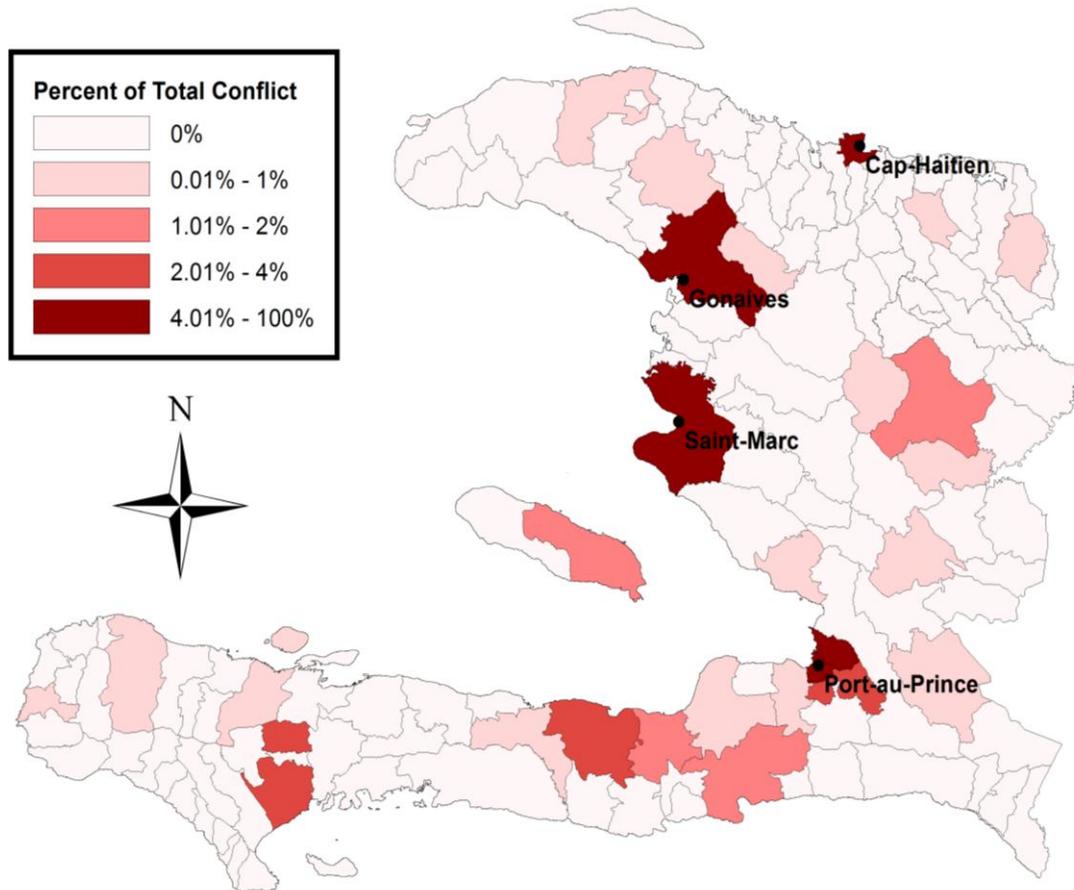


Figure 3-7. Percentage of total protest events for the 133 communes between 1997 and 2010.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

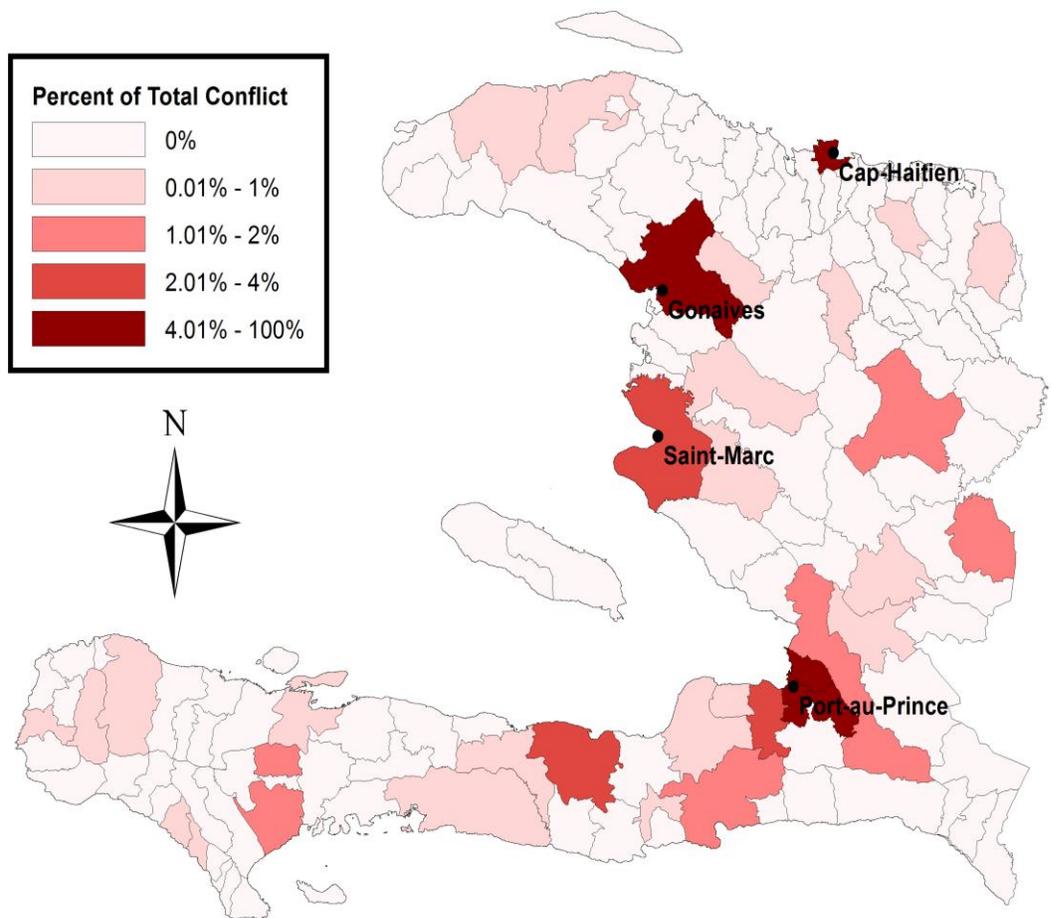


Figure 3-8. Percentage of total violence against civilians events for the 133 communes between 1997 and 2010.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

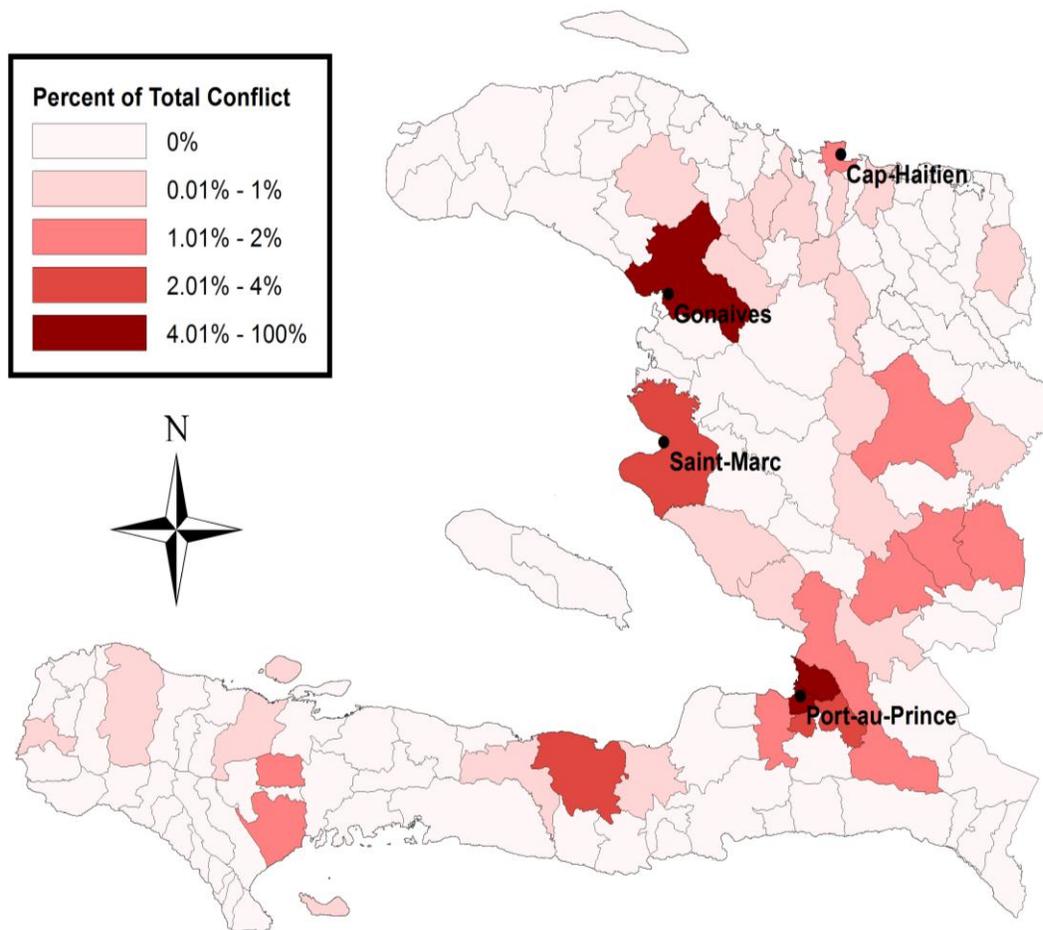


Figure 3-9. Percentage of total battles no change of territory events for the 133 communes between 1997 and 2010.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

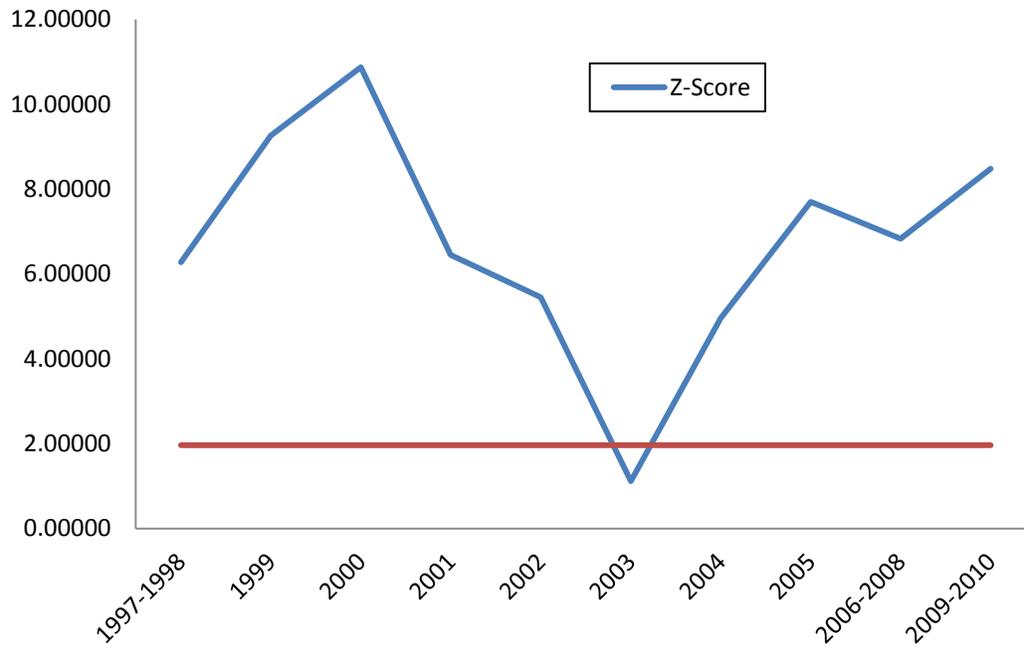


Figure 3-10. Global Moran's I evolution over time.

Note: Z-score of 1.96 indicates significant clustering at the five percent confidence level.  
 Source: User creation using Haiti ACLED (Raleigh et al. 2010).

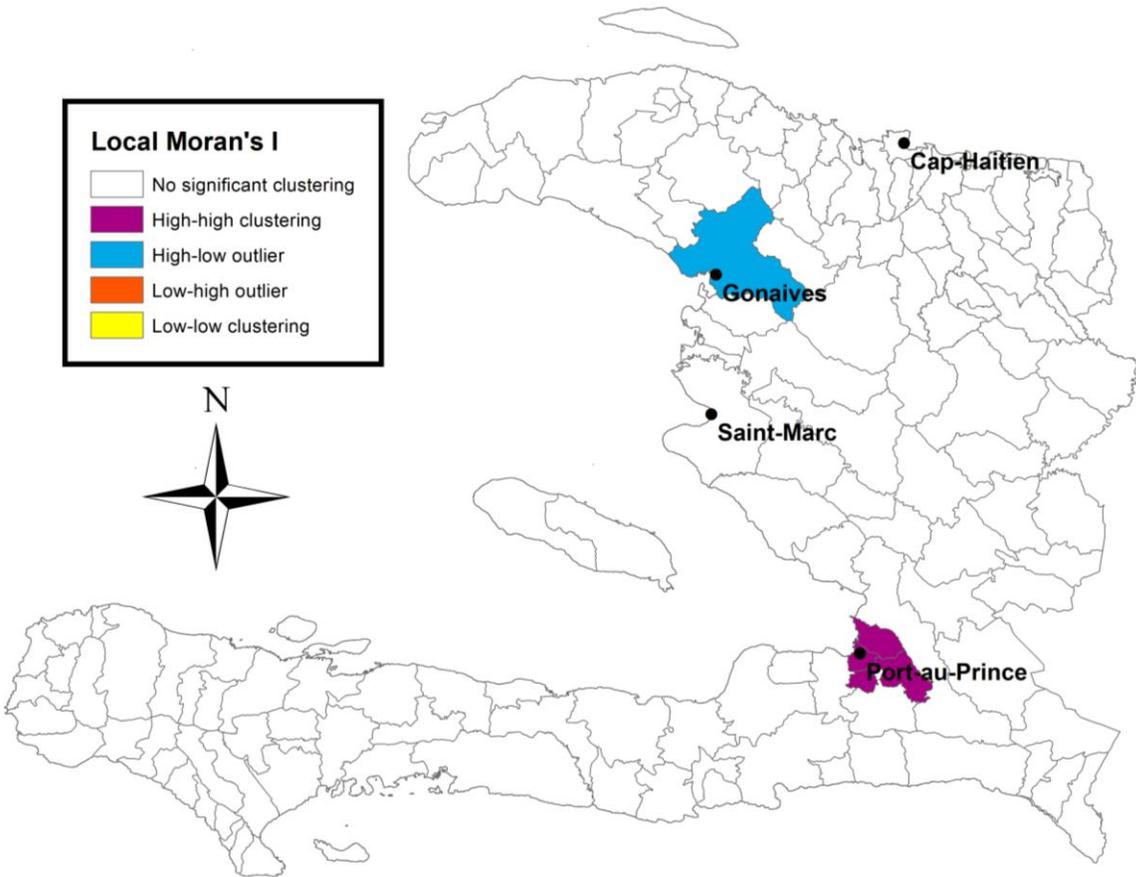


Figure 3-11. Local Moran's I for conflict in Haiti between 1997 and 2010.

Note: High-high clustering refers to a cluster of features with high values. Low-low clustering refers to a cluster of features with low values. High-low outlier refers to a feature with a high value surrounded by features with low values. Low-high outlier refers to a feature with a low value surrounded by features with high values.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

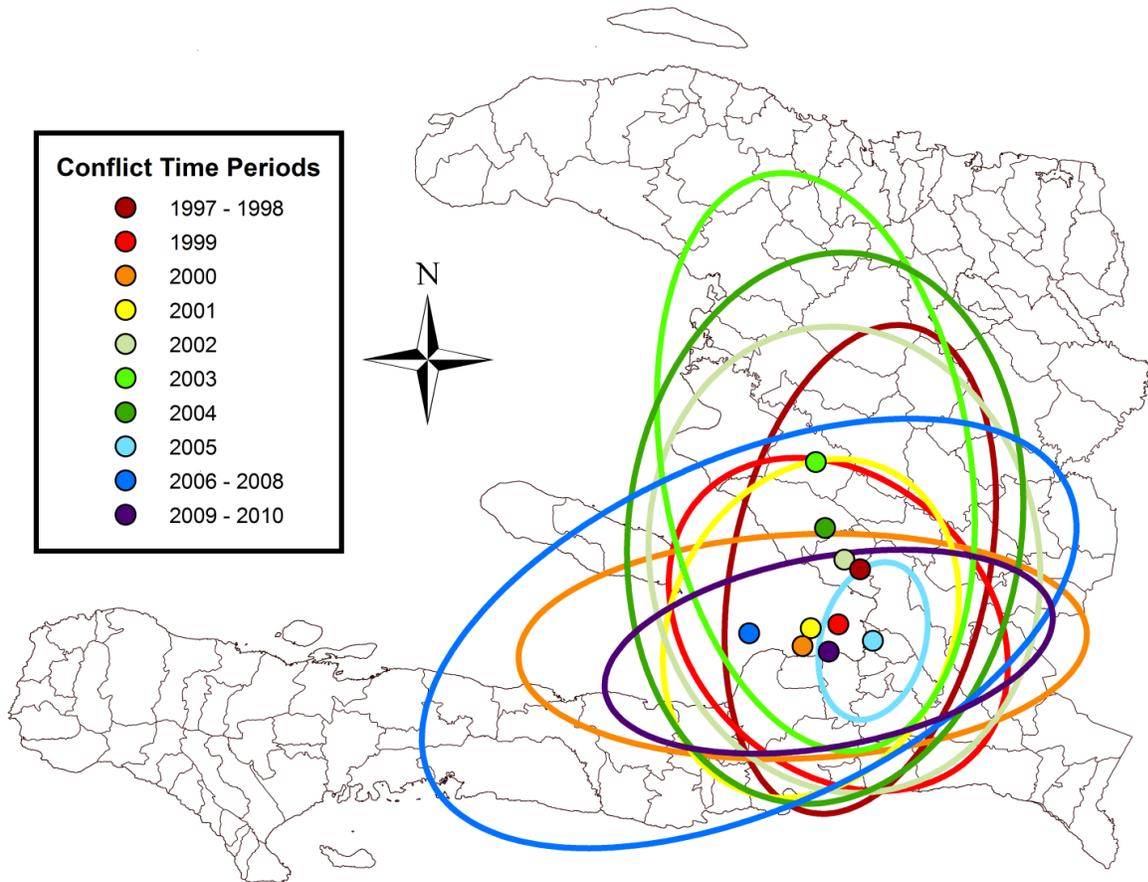


Figure 3-12. Mean center and standard deviational ellipses for different time periods.

Note: The point shape represents the mean center, and the circle shape represents the standard deviational ellipse.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

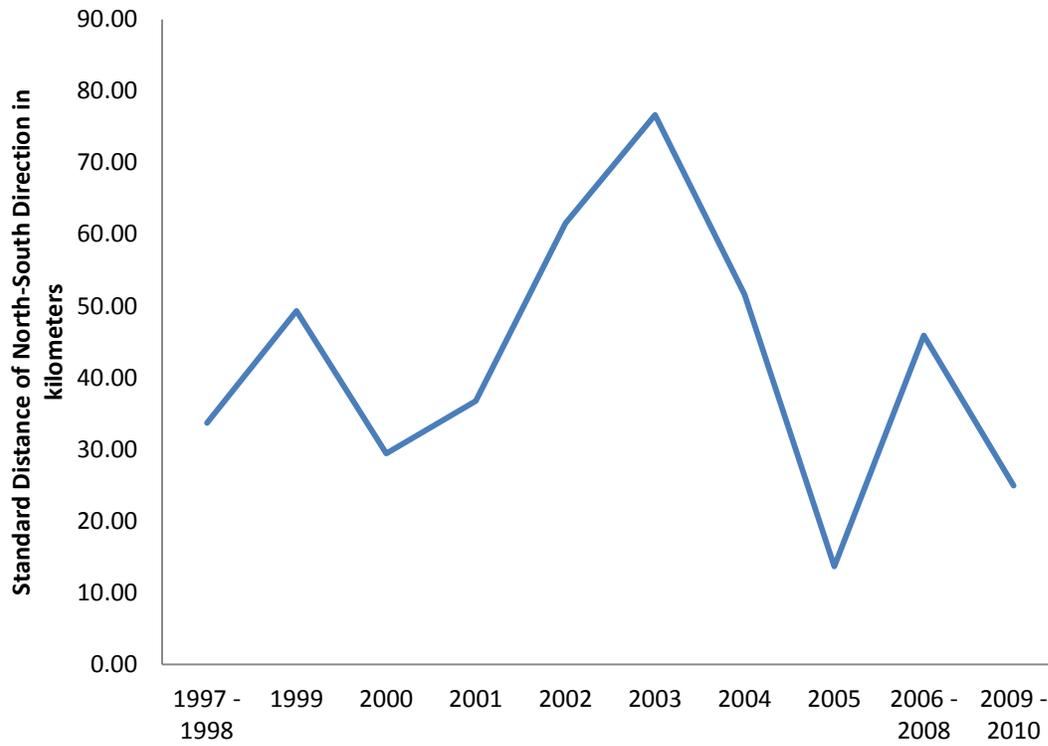


Figure 3-13. Standard distance of north-south direction in kilometers over time

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

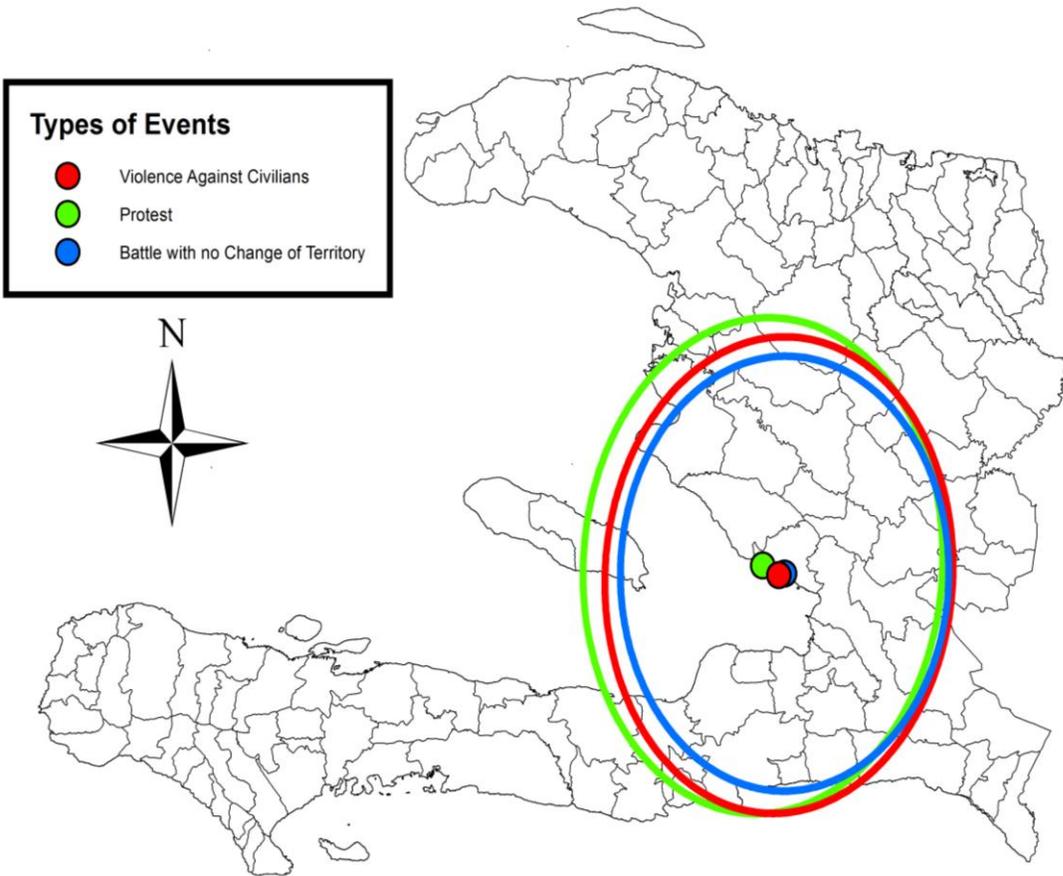


Figure 3-14. Mean center and standard deviational ellipses for different conflict events from 1997 to 2010 in Haiti.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

## CHAPTER 4 ANALYZING LOCAL PATTERNS OF CONFLICT IN HAITI

The study of conflict and civil war at a local, disaggregated level has become more frequent and common in recent years (e.g. Buhaug and Rød 2005; Hegre, Østby, and Raleigh 2009; O’Loughlin and Witmer 2011; Buhaug, Cederman, and Rød 2008). Prior to the last decade, conflict and civil war were studied at a country-level. The goal of country-level studies was to identify determinants of civil war, intrastate war, and conflict. These studies have determined that “large, politically unstable, poor, ethnically diverse, and oil-rich societies” (Halvard Buhaug 2010) are more prone to civil war and conflict. At the same time, country-level studies face challenges in fully explaining conflict and civil wars. “Some of the empirical results in the civil war literature are fragile, but others are not” (Hegre and Sambanis 2006). Country-level studies have robustly identified several determinants of conflict, but inferences have remained tenuous for others, such as religious and ethnic fractionalization. Furthermore, the result of country-level studies most likely do not hold true at a more disaggregated level. “Even if rudimentary transition of knowledge from the state to the sub-state level provides some hints at local determinants of civil war, we should be careful about such ‘stage diving’ as it might lead to erroneous inference” (Halvard Buhaug 2010). Country-level determinants of conflict and civil war must not be expected to be similar to sub-state level determinants.

Disaggregated studies of conflict and civil war have become more frequent in recent years. The use of Geographical Information Systems (GIS) and disaggregated data sources have made studies of local conflict and civil war possible. Disaggregated studies have further explored “conflict propensity and conflict characteristics” (Halvard

Buhaug and Lujala 2005) in localized contexts, and broadened the understanding of conflict mechanisms.

The geographical focus of disaggregated studies has primarily been in Africa so far, primarily due to the high prevalence of conflict in Africa, and the prevalence of several dataset with sub-state level information on conflict in Africa (e.g. Buhaug and Rød 2005; Hegre, Østby, and Raleigh 2009; Buhaug and Lujala 2005). Other researchers, such as O'Loughlin (O'Loughlin and Witmer 2011; O'Loughlin, Witmer, and Linke 2010; O'Loughlin et al. 2010), focused on the Middle East or parts of the former Soviet Union in their research. Little attention has been given to the Americas in disaggregated studies of conflict.

### **Disaggregated Study of Conflict in Haiti**

Carol Faubert stated the following about Haiti in 2006:

Haiti has been engaged in a seemingly endless political transition punctuated by several military coups, outbursts of violence and foreign military interventions. Haiti is a case of a lingering political and governance crisis accompanied by a severe degradation of the economy, of security and of livelihoods. (Faubert 2006)

The Haitian state has been described as a predatory state. Political power is primarily used to gain economic prosperity and wealth in Haiti, and seldom has political power been used to engage in long term economic growth and development. Mats Lundhal explained the predatory state in this way:

Successful politics was a way to make the best of livings, pure and simple. A monotonously repetitive pattern was established whereby a clique made its way into government via a revolution or a coup, emptied the treasury, sometimes indebting the state in the process, before it was toppled by another revolution or coup, which put the next clique into office, etc., ad nauseam. (Lundahl 2008)

Historically, control over the state was crucial in gaining economic prosperity and wealth in Haiti. The existence of a predatory state in Haiti encouraged the frequent use of violence to gain power and control of the state. Haiti never had a stable and peaceful security situation, but rather political instability and low-levels of conflict remained part of the Haitian identity throughout its history.

Even though conflict and violence have remained prevalent throughout Haiti's history, most of the analysis of conflict has been purely descriptive in nature, and few systematic analyses have been undertaken. In 2006, Kolbe and Hutson used a random sample household survey to assess levels of conflict and violence in Port-au-Prince in 2004. Kolbe and Hutson surveyed "1260 household (5720 people)" (Kolbe and Hutson 2006) in the greater metropolitan area of Port-au-Prince, and asked them about their exposure to violence, since President Aristide left office in 2004. "Crime and systematic abuse of human rights were common in Port-au-Prince. Although criminals were the most identified perpetrators of violations, political actors and UN soldiers were also frequently identified" (Kolbe and Hutson 2006).

Geographic patterns of violence in Haiti have not been systematically explored, nor have determinants of conflict and violence for Haiti been determined. The ACLED provides geographic and temporal data of conflict and violence in Haiti. The dataset covers the period between 1997 and 2010, and allows for the disaggregated study of conflict and violence in Haiti. It enables the exploration of multiple questions about conflict in Haiti. What determinants correlate with conflict and violence in Haiti? Are the determinants of conflict and violence similar to the one's determined in other contexts, such as countries in Africa?

## **Determinants of Conflict in Haiti**

The determinants included in the analysis of conflict in Haiti were primarily selected a priori for the statistical analysis since those determinants had been shown to be correlates of violence in other countries or regions. Environmental, geographic, demographic, economic, and institutional determinants have been used in prior disaggregated studies of conflict. All of our variables were collected at the third-order administrative level. In Haiti the third-order administrative units are the communes. The choice of the commune as the level of analysis enables us to study conflict determinants at a small-scale level, while maintaining an internal coherence for the unit of analysis.

Haiti is an ethnic, religious, and culturally homogenous country. In most other studies of conflict and civil war, ethnic and religious fractionalization was considered in the analysis of conflict and violence. In Africa, in particular, multiple distinct ethnic groups exist inside of a country, and ethnic tension impacts conflict propensity. Furthermore, in countries, such as Nigeria, civil war and conflict has had a religious dimension. The unique, relative homogeneity of Haiti allows us to disregard ethnic and religious difference, focusing our attention on economic, demographic, institutional, and geographic factors.

### **Population Size in a Given Location**

The U.S. Census Bureau provides population and demographic data for Haiti. The U.S. Census Bureau developed “high-resolution gridded population maps based upon a combination of census data and satellite image analysis” (U.S. Census Bureau 2010) to provide more information and help in times of natural disasters, which are a common occurrence in Haiti. The U.S. census bureau also provided census data at the commune level, which were employed to analyze conflict in Haiti.

The proposed relationship between population size and conflict propensity is that when population size rises in a given location, the propensity for conflict increases as well. Hegre and Raleigh stated the following about the proposed relationship:

The simplest explanation of the national-level relationship between population size and the risk and extent of conflict is based on the assumption of a constant and homogenous 'per-capita conflict propensity'. If there is a given probability that a randomly picked individual starts or joins a rebellion, then the risk of rebellion increases with population. (Raleigh and Hegre 2009)

All other things equal, the risk of conflict and violence at a given location must increase with population size rising at the given location. Figure 4-1 shows the population size per commune in Haiti. The population size per commune varies significantly throughout Haiti. Population size is particularly high in the greater metropolitan area of Port-au-Prince, Gonaïves, Cap-Haïtien, and Saint-Marc. Overall population size is relatively low in the south-western part of Haiti, and in the north-eastern part of Haiti. In the particular context of Haiti, the conflict propensity should be greater in the Port-au-Prince, Gonaïves, Cap-Haïtien, and Saint-Marc, and lower in the south-west and north-east of Haiti.

### **Urban Population Percentage in a Given Location**

The U.S. Census Bureau also provided the percentage of urban population in a given commune. Several researchers have determined that a link between the percentage of urban population and conflict and violence in a location exists (O'Loughlin and Witmer 2011; Raleigh and Hegre 2009; Halvard Buhaug and Rød 2005). "Multiple studies find that urban and densely populated places experience far more conflict than peripheral, rural areas" (Raleigh et al. 2010).

In urban areas, the proximity of people to each other is smaller than in rural areas. People find it easier to organize themselves together to engage in protest, violent behavior, or engage in conflict, since proximity to each other is lower.

Furthermore, an economic explanation for the tendency of urban areas to be more conflict ridden exists as well. Urban areas represent economic and political power centers, and due to their importance urban areas become the target of conflict and violence.

Additionally, in urban areas clusters of wealth and poverty exist in close proximity to each other. The overall wealth disparities of urban areas could motivate groups or individuals to engage in acts of conflict to possibly capture some of the wealth, and negotiate a different distribution of the wealth. Similarly, wealth disparities present differences in preferences and ideas, which can lead to greater conflict potential between the wealthy and the poor. The Lavalas movement advocated the rights, ideas and preferences of the poor, and wealthy Haitians generally were opposed to these goals. Between 1997 and 2010, the political ideas and preferences between the poorest Haitians and wealthiest Haitians did not overlap.

Figure 4-2 shows the urban population percentage in a given commune in Haiti. Not surprisingly, communes with major population centers in them also have large urban population percentages. The interior of the country predominately has low urbanization rates indicating that most of the country is rural, instead of urban. In general, urbanization is greater on the Haitian coastline. Lastly, there are several communes with low population size number, but larger urbanization rates. A particular

example of this is the north-eastern commune of Fort-Liberté, which has 26,679 inhabitants but an urbanization rate of 62.31 percent.

### **Male Population Percentage in a Given Location**

The U.S. Census Bureau also provided the percentage of male population in a given commune. The male or female population percentage throughout a developing country is not homogenous, but significant variations in male and female population percentages can occur throughout a country. The variations are partially caused by internal and international migration patterns. The economic opportunities for male and female citizens vary geographically, and migration enables citizens to benefit from the presented opportunities.

Stefan Alscher, a researcher at the Centre of Migration, Citizenships and Development, in Bielefeld, Germany, stated the following about the Dominican Republic: “women are looking for alternatives in domestic service and are forced to migrate to urban centers” (Alscher 2011). Females have a greater propensity for urban migration than male citizens in the Dominican Republic, and our a-priori assumption is to expect a similar trend in Haiti. Figure 4-3 shows the male population percentage in various communes throughout Haiti. Male population percentage is high in the western part of Haiti. The male population percentage is generally low in the major population centers of Haiti, such as the greater metropolitan area of Port-au-Prince, Gonaïves, Cap-Haïtien, and Saint-Marc.

The possible impact of male population percentage on conflict propensity could be two-fold. For one, males might have a higher propensity of engaging in conflict or violent behavior. Armed groups, armies, and rebel groups recruit primarily males, and most armies and armed groups consist solely of males.

Furthermore, females migrate to metropolitan areas searching for economic opportunities. Urban and metropolitan areas might present these economic opportunities, but these economic opportunities could in turn enhance conflict propensity. If economic opportunities are scarce in migration destination areas, then in migration centers significant parts of the population might be economically grieved or dissatisfied. Hence, male population percentage might increase as well as decrease conflict propensity in a given location.

### **Adult Population Percentage in a Given Location**

The U.S. Census Bureau also provided the percentage of adult population percentage in a given commune. The adult population percentage in a given location depends upon an array of factors. The birth rate in rural areas exceeds birth rates in urban areas, and the number of adult population consequently should be higher in urban areas. Additionally, rural to urban migration could impact adult population percentage in a location. In general, young adults have greater social mobility, and young rural adults would be most likely to migrate to urban centers.

The adult population percentage in a given commune is impacted by migration patterns, and the economic necessities behind the causes of migration, and most importantly it represents the rural-urban divide. In general, adults have a greater conflict propensity than non-adults. Conflict should be more frequent as the adult population percentage in a commune rises.

### **Distance from Political Center**

In previous disaggregated studies of conflict and civil wars (Halvard Buhaug, Cederman, and Rød 2008; Raleigh and Hegre 2009) , the relative distance of a location in relation to the political center was shown to have an impact upon conflict propensity

in a given location. The political power of the government remains strongest in the capital, as long as the government has firm political control over it. “Power decays as it is projected across distance” (Halvard Buhaug, Cederman, and Rød 2008); the government is expected to find it easier to militarily and politically control areas in the capital or close to the capital than areas further away from the capital. “The capability of a country (a.k.a. its national strength) is largest at its home base and declines as the nation moves away. Capable states are relatively less impeded by distance and can therefore influence more distant regions” (Halvard Buhaug 2010).

The Haitian state has historically been weak, but interestingly between 1997 and 2010 the state might have been temporarily stronger. Robert Fatton described the Haitian state throughout the 1980s as one where “massive corruption and state predation” (Fatton 2006) existed. The Haitian state did not change much since the 1980s. However, the Lavalas movement headed by Aristide, but also supportive of Préval, was strong and aligned themselves with the state throughout their respective reigns. Hence, since both regimes enjoyed popular support the power of the state might have been higher than usual both during Préval’s and Aristide’s reigns. The distance between a given commune and Port-au-Prince is calculated by measuring the distance of the centroid of the commune and the centroid of the Port-au-Prince commune.

### **Elevation Data in Haiti**

The “Mid-American Geospatial Information Center (MAGIC) provides access to NASA remote sensing data” (MAGIC 2011), and “combines products from NASA's remote sensing programs with Texas-based developments in leading-edge information technology” (MAGIC 2011). In response to the earthquake in Haiti in 2010, MAGIC developed geospatial elevation models from remote-sensing data sources.

Localized geographical factors can impact conflict propensity in a given location. Elevated areas can serve as a refuge area for rebel groups, and can be of strategic value to rebel groups, due to the cover and protection these areas offer.

Furthermore, military actions in low lying areas should be preferable to military groups with high military strength. The probability of success of ambushes by military groups with limited military strength is lower in low elevation areas. Hence, the stronger military force in a conflict would prefer military actions to take place in low elevation areas, while the weak military force would prefer action to take place in high elevation areas, which provides shelter and protection. Using the elevation data provided by MAGIC, we calculated the mean elevation per commune. . Figure 4-5 shows the mean elevation per commune.

Furthermore, we also calculated the standard deviation of elevation in a given commune. The standard deviation of elevation measures elevation differences in a commune. Commune with greater elevation differences could possibly make ambush attacks more likely. The likelihood of success of attack might be greater for an armed group, if geographic retreat locations are given. Areas with low standard deviations of elevation represent fewer opportunities to retreat after a battle, and could reduce overall conflict propensity in that location. Figure 4-6 shows the standard deviation of elevation.

Both the mean elevation per commune measurement and the standard deviation of elevation measurement attempt to encompass a localized geographic component into the analysis of conflict. The standard deviation of conflict measures localized variation of elevation to a greater degree, whereas the mean elevation is a more global measurement.

## **Border with the Dominican Republic**

In disaggregated studies of conflict, violence, and civil war, a particular emphasis has been placed upon border regions in a country. “Rebel groups may operate more easily in border areas since neighboring countries may provide (actively or tacitly allow) safe zones for rebels” (Raleigh and Hegre 2009). The propensity of conflict in border regions can be higher, due to the prevalence of rebel groups operating in the bordering countries and crossing the border to engage in battles or armed conflict.

In the particular context of Haiti, the G184 and CD held frequent strategic meetings throughout the Dominican Republic, the only country to have an international border with Haiti. Furthermore, former Haitian military members resided in the Dominican Republic. The Dominican Republic was a safe haven for the anti-Aristide opposition. To include the border effect into the study of conflict propensity, we developed a dummy variable indicating whether or not a commune directly borders the Dominican Republic border or not.

## **Departmental Capital in Haiti**

Haiti’s administrative structure can be divided into three different levels: ten departments, 41 arrondissements, and 133 communes. Every department also has a provincial capital. The provincial capital represents the regional center of political power. As a departmental capital, a city has important political infrastructure and serves as a regional hub.

The political power of the departmental capital also influences conflict propensity. Protest frequency can be expected to be higher in provincial capitals, since groups of people will advocate for change more frequently in regional centers of political power. Furthermore, armed groups and rebel groups should have an incentive to attempt to

gain control of a provincial capital, due to its strategic importance. Similarly, government forces have a greater motivation to defend the provincial capital, due to the importance of controlling the provincial capital. Provincial capitals represent a significant strategic value to protesters, armed groups, and government forces. Hence, conflict propensity should be greater in these cities. If a commune was a provincial capital, a dummy variable was created for it.

### **Distance to Route Nationale**

Haiti's highway and interstate road system is comprised of the eight Route Nationales. The Route Nationales connect the major population centers of Haiti, and most of the inter-regional transport goes along the Route Nationale. Geocommons (GeoCommons 2010) provided a shapefile including all of the roads in Haiti; from the shapefile, we extracted the eight Route Nationale highways. Figure 4-7 shows the Route Nationale highway system in Haiti. The major highway system in Haiti runs through many of the communes, and certainly all of the major population centers, but there are also areas not connected to the Route Nationale highway system, such as the south-western part and north-western part of Haiti.

Conflict propensity should be greater along the Route Nationale highway system. Buhaugh stated that "major highways and strategically located airfields and military bases massively increase the mobility and speed" (Halvard Buhaug 2010) of armed groups. Armed groups engage in conflict along major transportation networks, due to the strategic importance of the transportation network.

Furthermore, regions of the country, which are not connected to the major transportation network, should experience lower conflict propensity. In developing countries, travel to regions not connected to the major road network becomes arduous

and time consuming. Armed groups should have few incentives to participate in armed conflict in remote regions. Regions not connected to the major highway system are frequently less developed and less populous, which could reduce conflict propensity in those regions.

### **DHS Wealth Index Score**

Sub-national income and consumption surveys can be sparse in developing countries. In Haiti, a couple of surveys measure income or consumption at the department level, which is the first-order administrative level. In this study, we attempt to examine conflict at the third-order administrative level.

The Demographic and Health Surveys (DHS) conduct surveys in many developing countries exploring “population, health, HIV, and nutrition through more than 300 surveys in over 90 countries” (ICF International 2012). In addition to providing a vast array of information about health, education, and nutrition, the DHS provides information about household wealth. The DHS surveys include information about household wealth, and not household income or expenditures. “A common problem with both household income and consumption expenditures is their volatility. Income is very changeable in less developed countries, on both a seasonal and random basis” (Rutstein and Johnson 2004). The DHS wealth index measures the amount of assets a household owns, and composites them into a single index. Household assets are distributed differently at different wealth levels, and this fact allows the composition of a wealth index. Assets included in DHS wealth surveys usually are type of flooring, water supply, sanitation facilities, electricity, radio, television, telephone, refrigerator, type of vehicle, persons per sleeping room, ownership of agricultural land, domestic servant, and country specific items. The DHS wealth index is calculated in the following way:

Each household is assigned a standardized score for each asset, where the score differs depending on whether or not the household owned that asset (or, in the case of sleeping arrangements, the number of people per room). These scores are summed by household, and individuals are ranked according to the total score of the household in which they reside. The sample is then divided into population quintiles -- five groups with the same number of individuals in each. (ICF International 2012)

In Haiti the DHS wealth index scores range from -159,743 to 390,349, with the higher score indicating greater asset wealth. We then standardized the index score dividing it by 10,000, so that the index score ranged from -15.9743 (lowest) to 39.0349 (highest) for each household.

The DHS survey in 2005 included 339 survey sample locations, and 9998 household observations throughout Haiti. Six of the survey locations were not provided with geographic coordinates, indicating that the GIS experts working on the Haitian DHS survey did not trust the reliability of the provided coordinates. Hence, we in turn discarded those six survey locations. At every survey location, we calculated the average DHS wealth score index to have a composite wealth score for every survey location.

The survey locations contain geographic location data with “data randomly displaced up to 5 kilometers in rural areas and up to two kilometers in urban areas” (ICF International 2012). The displacement is not expected to significantly impact our analysis, due to the chosen methodology. Figure 4-8 shows the approximate DHS survey locations in Haiti. The survey locations are distributed on a frequent basis throughout Haiti’s regions. They are not necessarily representative at the third-order administrative level, the communes, though.

Hegre, Østby, and Raleigh encountered a similar issue in their analysis of conflict in Liberia (Hegre, Østby, and Raleigh 2009). In their research design, “only 101 of the

1,375 grid cells were covered by the Liberian DHS” (Hegre, Østby, and Raleigh 2009). The vast majority of their units of analysis included no survey sample locations. The researchers employed the Inverse Distance Weighted spatial interpolation methodology “which relies on the value of known sample points to estimate the values at surrounding points” (Hegre, Østby, and Raleigh 2009). Using this interpolation method, the researcher estimated the DHS wealth index for every unit of analysis in their analysis of conflict in Haiti.

Similar to Hegre, Østby, and Raleigh we employed a spatial interpolation method to estimate continuous DHS wealth scores throughout Haiti. Instead of using the IDW, I employed the ordinary Kriging method. The ordinary Kriging method is “based on statistical models that include autocorrelation—that is, the statistical relationships among the measured points” (ESRI 2011b). The following was stated about Kriging:

Kriging assumes that the distance or direction between sample points reflects a spatial correlation that can be used to explain variation in the surface. The Kriging tool fits a mathematical function to a specified number of points, or all points within a specified radius, to determine the output value for each location (ESRI 2011b).

The Kriging method and IDW both use the value of the variable of interest in surrounding locations to estimate a value in a given location. The Kriging method considers “not only the distance between the measured points and the prediction location but also on the overall spatial arrangement of the measured points” (ESRI 2011b).

Using ArcGIS, we estimated the prediction value for every location in Haiti. We decided to limit the number of sample points to perform the interpolation to six points,

and we chose this relatively low number of points to ensure greater local variability in the estimated wealth values. Furthermore, we limited the search distance to 25 kilometers, hence only sample points within a 25 kilometers radius were employed in the interpolation. For the vast majority of regions and points the maximum number of sample points were used to calculate the location estimate, but some locations, in particular in the rural areas of Haiti, used less than six sample locations. Figure 4-9 shows the wealth distribution estimated using the ordinary Kriging method in Haiti.

To arrive at an average wealth index score per commune, we multiplied the DHS score with the population size in a given location, Figure 4-10 shows the population for every 0.1 kilometers by 0.1 kilometers location in Haiti, and divided it by the overall population count in a commune:

$$AWC = \frac{\sum_{j=0}^{i=1} p_{i-j} * W_{i-j}}{PC}, \quad (\text{Equation 4-1})$$

where  $p_{i-j}$  is the estimated population at a particular point location,  $W_{i-j}$  is the estimated DHS wealth score at a particular point location, and  $PC$  is the overall population in a given commune. The AWC is the estimated, average wealth per person in a given commune. Figure 4-11 displays the average wealth per commune in Haiti. Generally, the coastal areas of Haiti appear to be wealthier than inner lying communes, which are primarily rural, agricultural areas. The major population centers in Haiti have greater wealth levels than communes with no major population centers.

### **Statistical Analysis**

The dependent variable in our case is the number of conflict events per commune; the conflict data set for Haiti is a count data set. “The most popular distribution for modeling counts is the Poisson distribution” (Hubbard 2006). The

Poisson distribution assumes that the mean is equal to the variance. In our model, the mean of the data is 7.9323 events per commune, but the variance is 1863.2; the high variance in the data suggests that a Poisson regression model is not suited to analyze conflict dynamics.

“There is an extension to Poisson regression, called negative-binomial regression, which can account for greater than Poisson variation and is based on the negative binomial distribution” (Hubbard 2006). The negative binomial regression model is explained in detail in Appendix–E.

### **Covariate Selection**

The dependent variable is the number of events in a commune in a given time period, or for a specific ACLED event type, such as protest. The covariate selection depended upon an a priori selection of pertinent determinants of conflict, and functionality inside of the specified model.

Initially, we created a covariance matrix, Table 4-1, for the time invariant covariates and the dependent variables, event counts per commune between 1997 and 2010. The covariance analysis shows no significant correlations between any of the proposed covariates. However, we decided to exclude the percentage of urban population in a given commune, since urban population percentage and the sum of population in a given commune are too similar in what they attempt to measure. The included covariates in our analysis are:

- Mean elevation of the commune.
- A dummy variable indicating whether or not a commune borders the Dominican Republic.
- A dummy variable indicating whether or not a commune also has a city with a department capital in it.

- The total population in a given commune divided by 10,000. We use a scalar to simplify the interpretation of our results.
- Distance from the geographic center point of the commune to the capital, Port-au-Prince.
- The distance of the commune centroid to the Route Nationale highway system.
- Estimated average wealth level per commune.

The Variance Inflation Factor (VIF) “is a measure of the multicollinearity in a regression” (National Institute of Standards and Technology 2002). Multicollinearity exists, when the covariates are interdependent and “can result in numerically unstable estimates of the regression coefficients” (National Institute of Standards and Technology 2002). The minimum VIF a covariate can have is one; in that case no correlation between the covariate of interest and all other covariates exists. Frequently, a value of greater than four for a covariate has been mentioned as critical, and indicates that multicollinearity could be an issue in the data. The largest VIF for any covariate is 2.2071 for the population measure in a commune. For the vast majority of covariates, the VIF is actually less than 2, and no concern arises for these variables. In general, it is probably safe to assume that multicollinearity is not a significant issue for the included covariates.

### **Model Validity**

The ACLED is both temporal and spatial. The temporal aspect will be considered to some extent in our analysis of conflict; the spatial aspect of the data will not be considered by the negative binomial regression model, which could introduce significant bias. Spatial autocorrelation impacts the estimates of the regression analysis, when the residuals are spatially correlated with each other. To assess any introduced bias, we tested the residuals of the global model, the negative binomial model including all

events between 1997 and 2010. Table 4-3 shows the Global Moran's I for the residuals of the negative binomial regression. The Global Moran's I score is 0.05958, which is not significant at the five percent confidence level. In our data, the residuals of the negative binomial regression are not spatially correlated with each other, and are independent of each other.

Simon Jackman, part of the Stanford Political Science Department, published the `pscl` (Jackman 2012) package for the R statistical program platform. The program contains a function to calculate Vuong's non-nested hypothesis test, which compares "two models fit to the same data" (Jackman 2012). In our analysis, we compared the negative binomial regression to a zero-inflated negative binomial regression model. A zero-inflated negative binomial regression model accounts for excessive zero counts in the dependent variable in addition to having the same properties as the negative binomial regression model. The zero-inflated negative binomial regression model assumes that a distinct process occurs, which causes the zero counts in the data to be inflated. A zero-inflated negative binomial regression model has been used by Håvard Hegre, Gudrun Østby, and Clionadh Raleigh in their analysis of conflict in Liberia (Hegre, Østby, and Raleigh 2009), due to overdispersion, use of count data, and excessive zero count dependent variables.

Using the Vuong's non-nested hypothesis test, we compared the model fit of the negative binomial regression model and the zero-inflated negative binomial regression model. The Vuong's non-nested hypothesis test established a test statistic of 2.3516, which correspond to a p-value of 0.0093. The null hypothesis can be rejected that both

models fit the data equally well, and it is 99 percent certain that the negative binomial model outperforms the zero-inflated negative binomial model.

Residual and deviance plots are an important model in checking statistical models. “In non-normal regression situations such as logistic regression or log-linear analysis, the residuals may be so far off normality and from having equal variance as to be of no practical use” (Dunn and Smyth 1996). The authors develop a randomization process “through which the aggregate patterns of the residuals become apparent ” (Dunn and Smyth 1996). Figure 4-12 shows the randomized quantile residuals for the general conflict model, which enables us to check the residual distribution. The residual distribution does not indicate that the model is misspecified. The assumption of normality is given in our model.

### **Determinants of Conflict in Haiti for Various Time Periods**

In Table 4-4 and Table 4-5, we report the estimates of the negative binomial regression for the Haiti conflict data. The table reports the coefficients, standard errors, and p-values for the various determinants of conflict. The dependent variable in the negative binomial regression is the natural logarithm of the count data, and interpretation of the coefficient must be done in light of that. The negative binomial regression model is defined as:

$$L(\beta|y, X) = \prod_{i=1}^N \Pr(y_i|x_i) = \prod_{i=1}^N \frac{\Gamma(y_i + \alpha^{-1})}{y_i! \Gamma(\alpha^{-1})} \left[ \frac{\alpha^{-1}}{\alpha^{-1} + \lambda} \right]^{\alpha^{-1}} \left[ \frac{\lambda}{\alpha^{-1} + \lambda} \right]^{y_i} \quad (\text{Equation 5-2})$$

where  $y_i$  is the dependent variable, number of conflict events per commune. The number of conflict events depends upon the model specifications.  $x_i$  is a vector of covariates, including the following covariates:

- Elev refers to the mean elevation of the commune.

- DomR refers to a dummy variable indicating whether or not a commune borders the Dominican Republic.
- Dep refers to a dummy variable indicating whether or not a commune also has a city with a department capital in it.
- Pop refers to the total population in a given commune divided by 10,000. We use a scalar to simplify the interpretation of our results.
- DC refers to the distance to the capital, Port-au-Prince.
- RN refers to the distance of the commune centroid to the Route Nationale highway system.
- Wea refers to the estimated average wealth level per commune.

Model 1 is the global model of conflict including all conflict events in Haiti between 1997 and 2010. Three determinants are significant at the one percent level in the model, and two determinants are significant at the five percent level. If a commune includes a capital of the first-order administrative units, (i.e. departments), conflict propensity in the first-order administrative unit rises. The population size per commune is the strongest determinant of conflict. As population size rises in a commune, conflict propensity in the given commune increases as well. “The risk of civil war events at a location increases with the size of the population at that location” (Raleigh and Hegre 2009). In Haiti, conflict propensity is greater in the population centers of the country, and significantly less in the rural, less populated areas of the country. The conflict literature has identified that “population size is the most robust correlate” (H. Buhaug 2010) of civil war and conflict, and our analysis confirms this. The distance to Port-au-Prince, the capital, is significant as well; the coefficient is negative. As distance to the capital rises, conflict propensity decreases. Conflict is more prevalent in Port-au-Prince than in areas further away from it. Civil wars primarily have two motivations and justifications. It is either the desire “to seek autonomy/secession or increased governmental influence” (H.

Buhaug 2010). In the case of Haiti, conflict is not caused by considerations of autonomy or secession by individual or groups, but Haiti is marked by a continuous struggle for government influence and control. Distance to the capital matters, since political actors and agents desire to control Port-au-Prince and are willing to employ force and violence to accomplish their goals. Additionally, areas in close proximity to the Route Nationale highway system have a greater conflict propensity. Clashes between armed groups, whether militia, gang, or army, occur often along or in proximity to the major national highway system, probably due to the strategic importance of the highway system. Access to the highway transportation systems makes participation in conflict and civil war events possible. Furthermore, conflict becomes more prevalent in areas with lower mean elevation. Conflict is more prevalent in low lying areas of Haiti, which are primarily the coastal areas of the country.

The average wealth level and border regions are not statistically significant. Surprisingly, there is no economic dimension to conflict in the global model of conflict. The average wealth determinant is not significant at the five percent level. Civil war has been explained in terms of greed or grievance, economic deprivation or economic opportunity. Even though Haiti is one of the poorest and unequal countries in the Western Hemisphere, poverty and inequality seem to have no effect on conflict propensity. A possible explanation might be the general disenfranchisement of the popular masses in Haiti. The popular masses have not been consistently involved in the political process over the last 200 years in Haiti, and the economic plight has been dismal for centuries now. Instead of being grieved by their economic plight, people in Haiti might have grown accustomed to the depravation, and are hence not motivated to

participate in acts of political conflict. Furthermore, Haiti has no natural resources, such as diamonds (Hegre, Østby, and Raleigh 2009) or oil, that would be of strategic importance and induce a struggle to control them.

Conflict must be rather understood in terms of demographic, political, and military strategic concerns. Conflict propensity rises in locations of high population density, areas of political importance, low-lying coastal areas, and in close proximity to Route Nationale highway system.

Model 2, the civil war model, covers the time period between September 2003 and June 2005. In September 2003, the rebellion against President Aristide broke out in the north of Haiti, continuing until President Aristide was ousted in February 2004. Afterwards, conflict intensity remained high because of clashes between pro-Aristide gangs and armed groups on the side of the new government of Gerard Latortue. Conflict remains more prevalent in locations with higher population density, areas of political importance, low-lying coastal areas, and in close proximity to Route Nationale highway system. Political, demographic, and military strategic reasons remain the main causes of conflict during the civil war time period.

The civil war model of conflict is similar to the global model of conflict. Both models only differ from each other in the significance of the coefficient estimates. The wealth determinant is almost significant at the five percent level, and is actually significant at the ten percent level; the coefficient for the wealth is negative. As average wealth level falls in a third-order administrative unit, the conflict propensity in it rises. If there is “an unequal geographical distribution of welfare” (Hegre, Østby, and Raleigh 2009), the location population can objectively be grieved by the inequality, and engage

in conflict to accomplish a redistribution of wealth, or to change the institutions causing the economic inequality. While this is certainly a plausible explanation, another explanation should be offered. President Aristide was primarily supported by the poor and economically deprived. Conflict might have been greater in economically deprived areas, since these areas were most supportive of President Aristide, and hence these areas became the target of violence and conflict. The rebel groups, and later the new government of President Gerard Latortue, might have purposefully targeted poorer areas, since these areas were in support of President Aristide.

Additionally a civil war, in its nature, is a dynamic process with the location of conflict and battles constantly evolving. Highways are the main route of transportation, and facilitate the movement of armed groups, and present a strategic value as well. And findings show that conflict intensity is higher in locations in close proximity to the Route Nationale highways.

Model 3 includes all events from 1997 to August 2003, and from July 2005 to 2010. Carrol Faubert described Haiti as a “a case of a lingering political and governance crisis accompanied by a severe degradation of the economy, of security and of livelihoods” (Faubert 2006). Historically, Haiti has experienced low-intensity continuous conflict. The use of force and violence to accomplish economic and political goals has been part of the Haitian social and political environment. The model employed here identifies local determinants of conflict, and offers a possible explanation of why low-intensity constant political conflict occurs in Haiti. The results of Model 3 are surprising. The low-intensity continuous conflict has a mass population effect, where conflict is greater in areas with higher population. No other determinant is significant at the five

percent level. The low-intensity conflict occurs with no particular political, economic, or military strategic motivation. Conflict propensity is solely greater in population centers of Haiti.

In Table 4-5, we report the estimates of the negative binomial regression for the various types of conflict reported in the Haiti ACLED. We model protest, violence against civilians by armed groups, and battles between two armed groups, since only these types of events had a significant number of conflict events to test their particular determinants.

The negative binomial regression provides similar estimates for the significance of the various coefficients for the three event types. Protest, violence against civilians by armed groups, and battles between two armed groups is greater in communes with a departmental capital in it, and also greater as total population in the commune rises. Regardless of the type of conflict, a political and demographic aspect to conflict propensity exists.

Model 1 indicates that the distance to the capital is a significant determinant of protest. Protest propensity rises in close proximity to Port-au-Prince, the capital. Port-au-Prince is the political center of Haiti, and any agent willing to change institutions in Haiti is more inclined to advocate, such changes in the capital. Additionally, abuses of political power are most frequently observed and noticed in Port-au-Prince, which could also impact protest propensity in Port-au-Prince.

The distance to the Route Nationale highway system is a significant determinant of battles between two armed groups at the one percent confidence levels. Battles between two armed groups occur more frequently in close proximity to the Route

Nationale highway system, but the distance to the Route Nationale highway system is not a significant determinant of conflict for the two other types of conflict tested here. Buhaug stated that “major highways and strategically located airfields and military bases massively increase the mobility and speed” (Halvard Buhaug 2010) of armed groups. Major highways play a crucial role in conflicts between two armed groups, due to the strategic and military importance of them.

In general, little variation between the determinants of conflict for the protest, violence against civilians by armed groups, and battles between two armed groups exists. Protest most commonly is a non-violent activity, whereas the other two event types are violent in nature. Even though this systematic difference exists, there is little variation in the determinants of the different types of conflict. The analysis indicates that conflict has similar root causes, which do not depend on how violent the conflict event itself is. Different types of conflict are more similar than they are different from each other.

Table 4-1. Correlation matrix of covariates and dependent variable

	Evts	Elev	DomR	Dep	Pop	DC	RN	Wea
Evts	1.0000							
Elev	0.0740	1.0000						
DomR	0.0510	0.2142	1.0000					
Dep	0.3950	0.1170	0.1054	1.0000				
Pop	0.8065	0.0212	0.0963	0.3975	1.0000			
DC	0.2437	0.3343	0.2204	0.0204	0.4064	1.0000		
RN	0.1549	0.0577	0.0173	0.2354	0.2259	0.2813	1.0000	
Wea	0.4030	0.1611	0.1292	0.3287	0.6051	0.3397	0.3540	1.0000

Note: Evts refers to the number of ACLED events per commune between 1997 and 2000. Elev refers to the mean elevation of the commune. DomR is a dummy variable indicating, whether or not a commune borders the Dominican Republic. Pop refers to the total population in a given commune. LogPD refers to the logarithm of the population density in a given commune. UrbPer indicates the amount of urban population percentage in a given commune. DC refers to the distance to the capital, Port-au-Prince. RN refers to the distance of the commune to the Route Nationale highway system. Wea refers to the estimated average wealth level per commune. Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 4-2. Variance inflation factor

	VIF
Elev	1.2575
DomR	1.1132
Dep	1.3229
Pop	2.2071
DC	1.7061
RN	1.2199
Wea	2.0624

Note: Elev refers to the mean elevation of the commune. DomR is a dummy variable indicating, whether or not a commune borders the Dominican Republic. LogPD refers to the logarithm of the population density in a given commune. UrbPer indicates the amount of urban population percentage in a given commune. DC refers to the distance to the capital, Port-au-Prince. RN refers to the distance of the commune to the Route Nationale highway system. Wea refers to the estimated average wealth level per commune

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 4-3. Global Moran's I score for residual of the negative binomial regression

Moran's I Score	Expected Moran's I	Z-score	P-Value
0.05958	-0.00758	1.11785	0.26363

Note: = Z-score of 1.96 indicates significant clustering at the five percent confidence level. The distance threshold was set to 50 kilometers.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 4-4. Determinants of conflict events in Haiti for various time periods

	Model 1 1997 - 2010	Model 2 Civil War Model	Model 3 Low-intensity Conflict
C	0.8513 (0.5501) [0.1218]	0.6525 (0.6634) [0.3253]	-0.3154 (0.6791) [0.6423]
Elev	-0.0014 * (0.0006) [0.0335]	-0.0012* (0.0008) [0.1253]	-0.0010 (0.0008) [0.1917]
DomR	0.4782 (0.4129) [0.2468]	0.0934 (0.5150 ) [0.8560]	0.8402 (0.4896) [0.0861]
Dep	1.2166** (0.4607) [0.0082]	1.4601** (0.4950) [0.0032]	0.8884 (0.5573) [0.1109]
Pop	0.0139** (0.0017) [0.0000]	0.0128** (0.0018) [0.0000]	0.0133** (0.0020) [0.0000]
DC	-0.0069 * (0.0033) [0.0402]	-0.0084** (0.0041) [0.0385]	-0.0122 (0.0041) [0.2615]
RN	-0.0380* (0.0166) [0.0218]	-0.0745* (0.0232) [0.0014]	-0.0186 (0.0210) [0.3403]
Wea	-0.0449 (0.0357) [0.2086]	-0.0771 (0.0413) [0.0615]	-0.0059 (0.0433) [0.8916]
N	133	133	133
Non-zero	63	46	44
Theta	0.770	0.722	0.578
Log likelihood	-437.240	-320.321	-322.922
AIC	455.24	338.32	340.92

\*\*p<0.01. \*p<0.05 (two-sided tests). Table entries are coefficients, with standard errors in parentheses, and with p-values in brackets.

Note: C refers to the constant of the negative binomial regression model. Elev refers to the mean elevation of the commune. DomR is a dummy variable indicating, whether or not a commune borders the Dominican Republic. Pop refers to the total population in a commune divided by 10,000. DC refers to the distance to the capital, Port-au-Prince. RN refers to the distance of the commune to the Route Nationale highway system. Wea refers to the estimated average wealth level per commune. N is the number of areas, communes. Theta is the dispersion factor. Log likelihood and AIC assess the model fit.

Note: Model 1 includes all events from 1997 to 2010. Model 2 includes only events from September 2003 to June 2005. Model 3 includes only events from 1997 to August 2003, and from July 2005 to 2010.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

Table 4-5. Determinants of Conflict Events in Haiti for Various Time Periods

	Protest	Battle – No Change of Territory	Violence Against Civilians
C	-0.0520 (0.9233) [0.9551]	-0.2009 (0.6886) [0.7705]	-1.3855 (0.7792 ) [0.0754]
Elev	-0.0014 (0.0011) [0.2038]	-0.0003 (0.0007) [0.6625]	-0.0007 (0.0009) [0.4620]
DomR	0.0477 (0.7142) [0.9468]	0.7262 (0.4864) [0.1354]	0.7189 (0.5532) [0.1938]
Dep	1.9608* (0.6897) [0.0045]	0.9354* (0.4639) [0.0438]	1.3289 * (0.5480) [0.0153]
Pop	0.0142** (0.0025) [0.0000]	0.0090** (0.0016) [0.0000]	0.0148** (0.0020) [0.0000]
DC	-0.0123 ** (0.0057) [0.0312]	-0.0065 (0.0043) [0.1324]	-0.0035 (0.0046) [0.4568]
RN	-0.0308 (0.0291) [0.2899]	-0.0780** (0.0271) [0.0032]	-0.0165 (0.0226) [0.4646]
Wea	-0.0506 (0.0567) [0.3725]	-0.0188 (0.0398) [0.6376]	-0.0328 (0.0472) [0.4865]
N	133	133	133
Non-zero	28	36	34
Theta	0.376	1.232	0.705
Log likelihood	-240.525	-223.677	-243.396
AIC	258.52	241.68	261.4

\*\*p<0.01. \*p<0.05 (two-sided tests). Table entries are coefficients, with standard errors in parentheses, and with p-values in brackets.

Note: C refers to the constant of the negative binomial regression model. Elev refers to the mean elevation of the commune. DomR is a dummy variable indicating, whether or not a commune borders the Dominican Republic. Pop refers to the total population in a commune divided by 10,000. DC refers to the distance to the capital, Port-au-Prince. RN refers to the distance of the commune to the Route Nationale highway system. Wea refers to the estimated average wealth level per commune. N is the number of areas, communes. Theta is the dispersion factor. Log likelihood and AIC assess the model fit.

Note: Model 1 includes all events from 1997 to 2010. Model 2 includes only events from September 2003 to June 2005. Model 3 includes only events from 1997 to August 2003, and from July 2005 to 2010.

Source: User creation using Haiti ACLED (Raleigh et al. 2010).

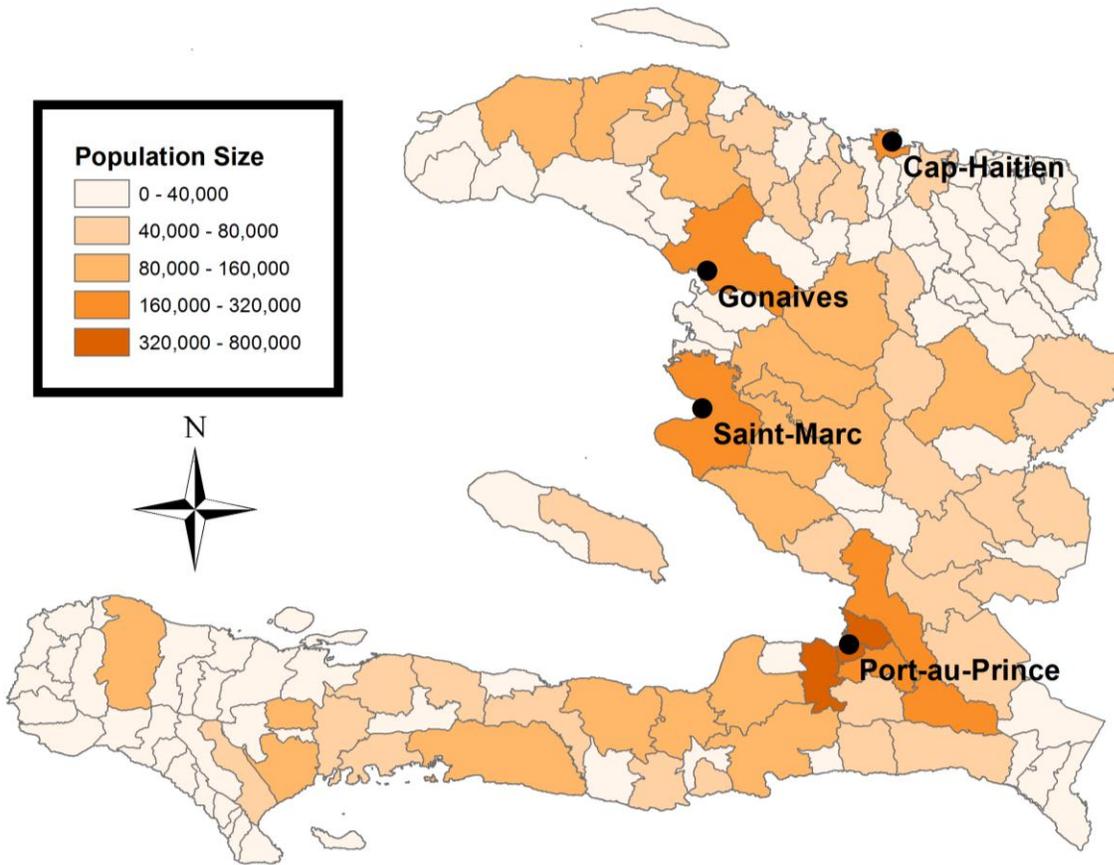


Figure 4-1. Population size per commune in Haiti in 2003.

Source: User creation using U.S. Census demographic data (U.S. Census Bureau 2010).

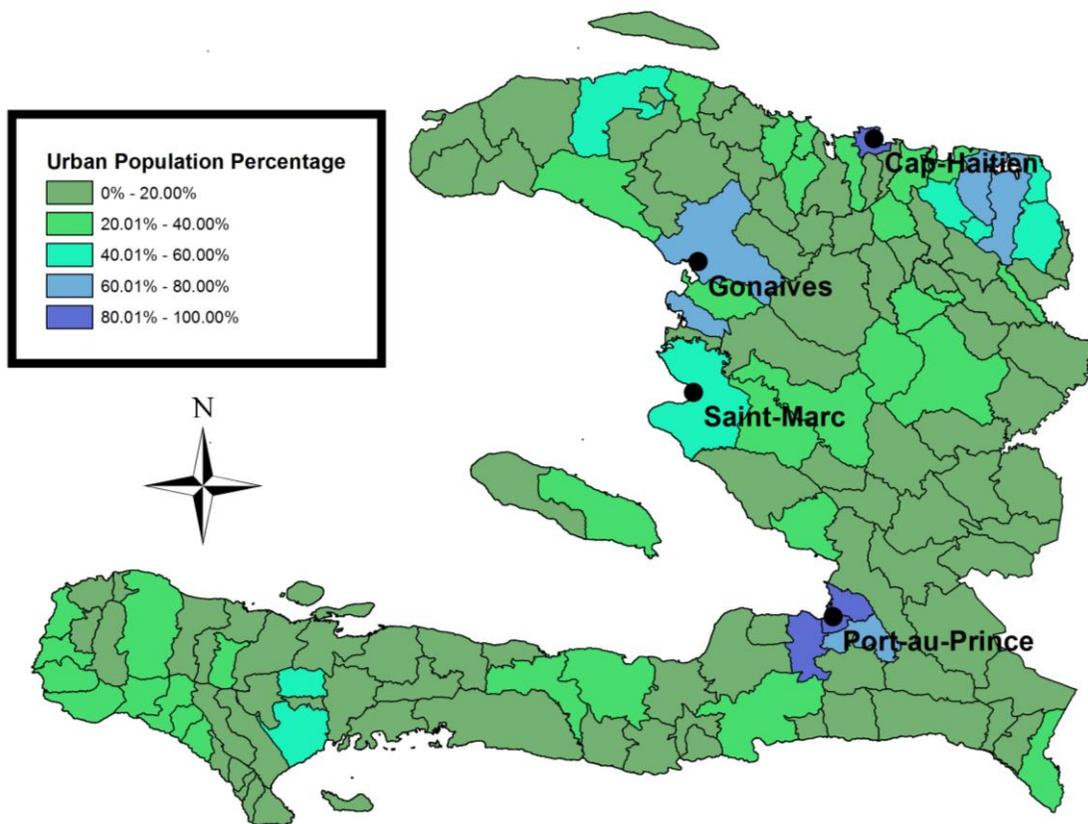


Figure 4-2. Urban population percentage per commune in Haiti in 2003.

Note: Urban population percentage per commune was derived by dividing the total number of urban population per commune by the overall population per commune. Source: User creation using U.S. Census demographic data (U.S. Census Bureau 2010).

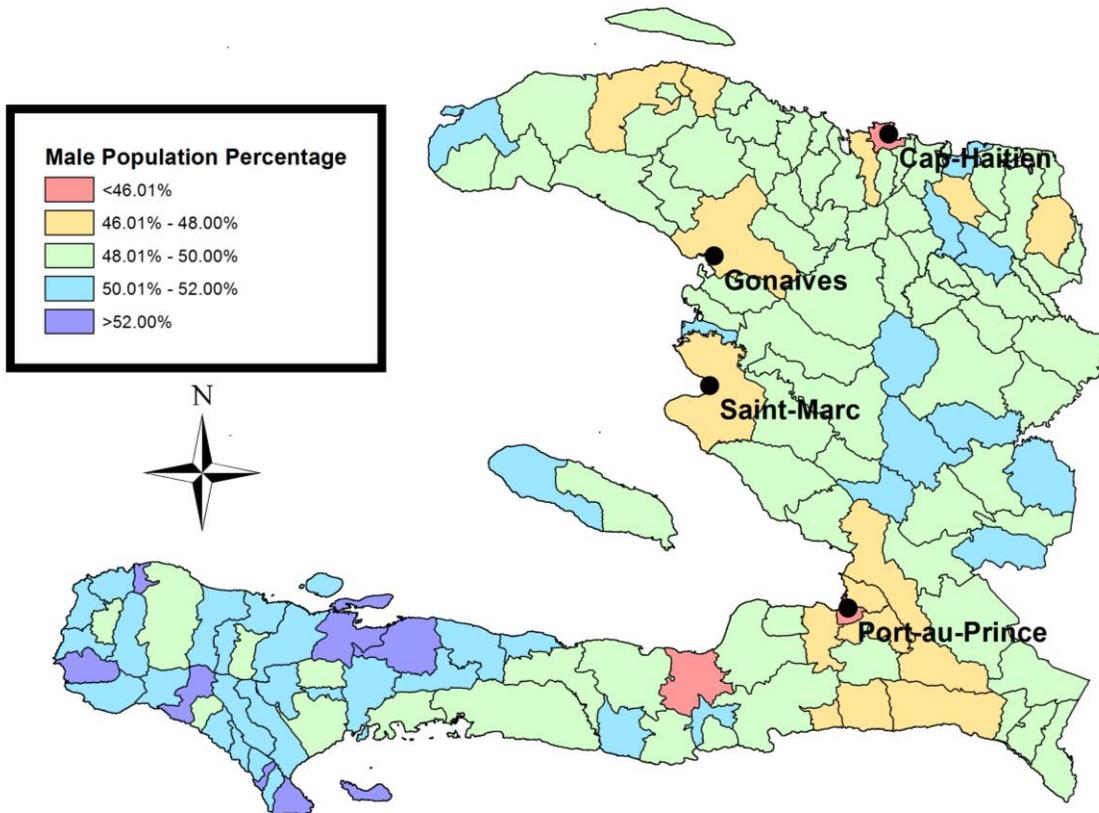


Figure 4-3. Male population percentage per commune in Haiti in 2003.

Note: Male population percentage per commune was derived by dividing the total number of male population per commune by the overall population per commune. Source: User creation using U.S. Census demographic data (U.S. Census Bureau 2010).

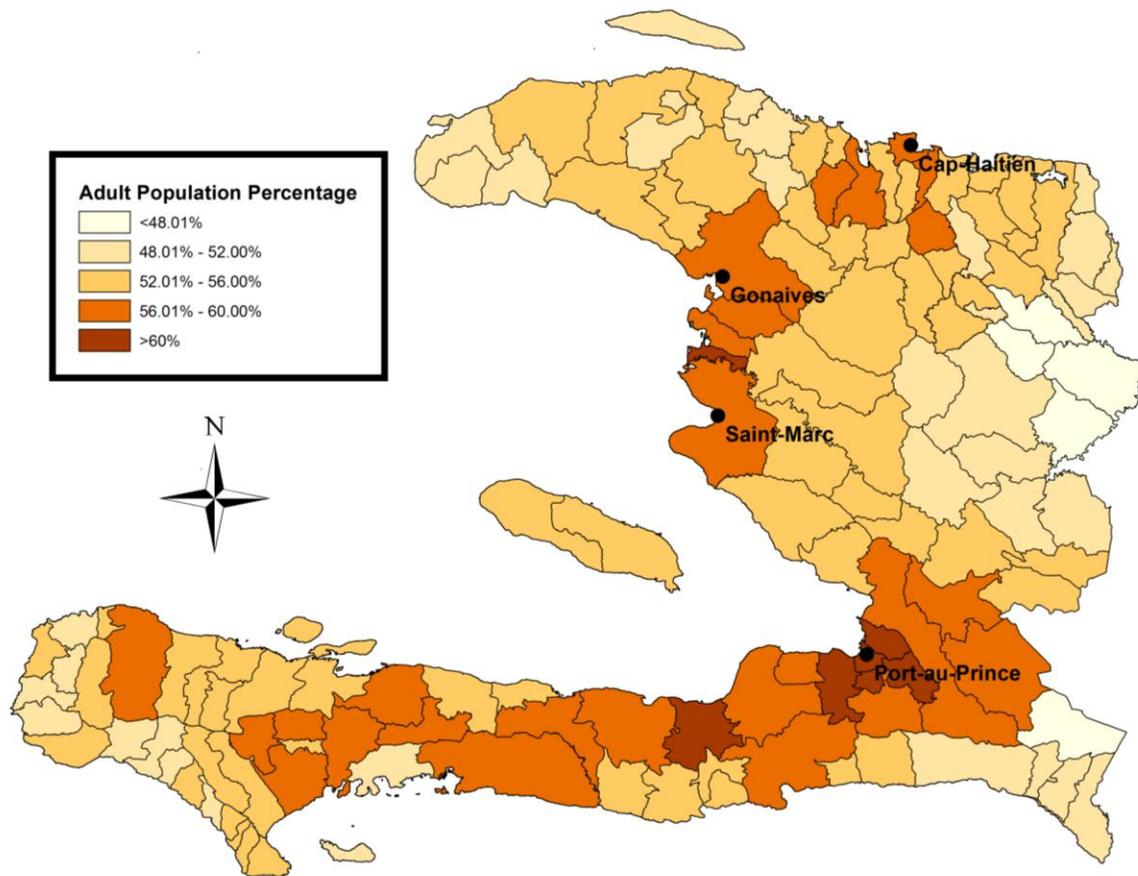


Figure 4-4. Adult population percentage per commune in Haiti in 2003.

Note: Adult population percentage per commune was derived by dividing the total number of adult population per commune by the overall population per commune.  
 Source: User creation using U.S. Census demographic data (U.S. Census Bureau 2010).

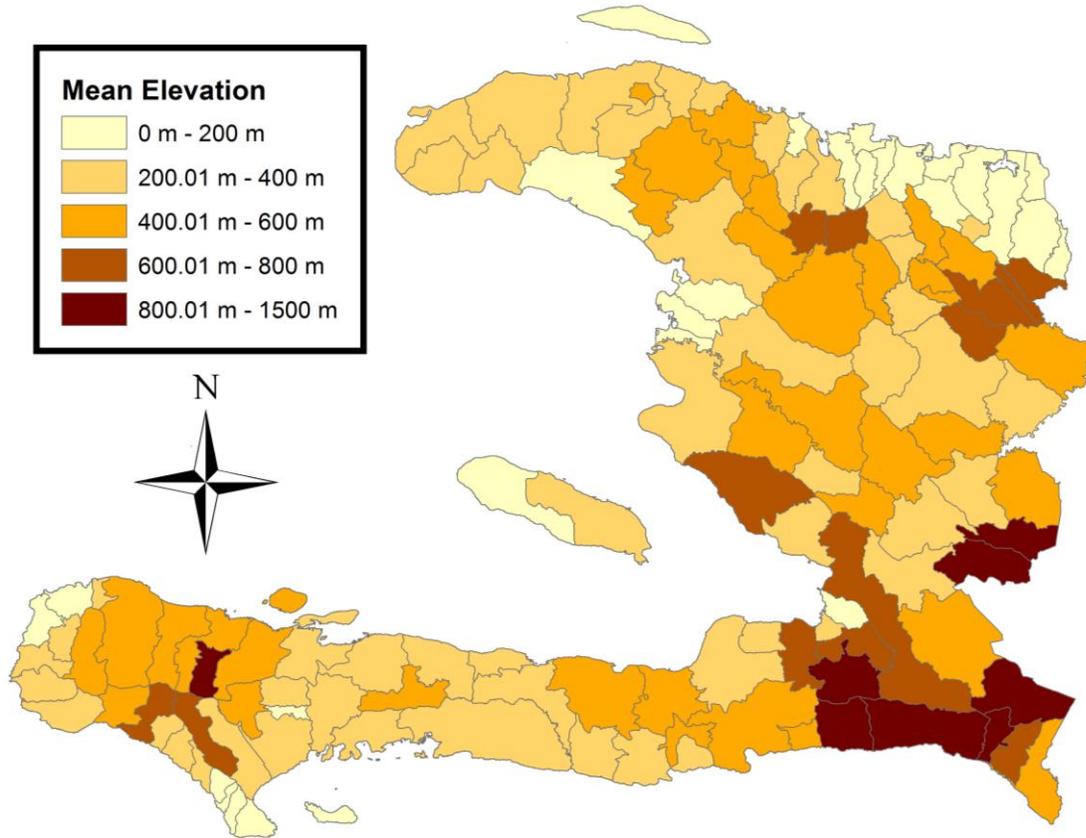


Figure 4-5. Mean elevation per commune in Haiti in meters.

Source: User creation using Mid-American Geospatial Information Center (MAGIC) data (MAGIC 2011)

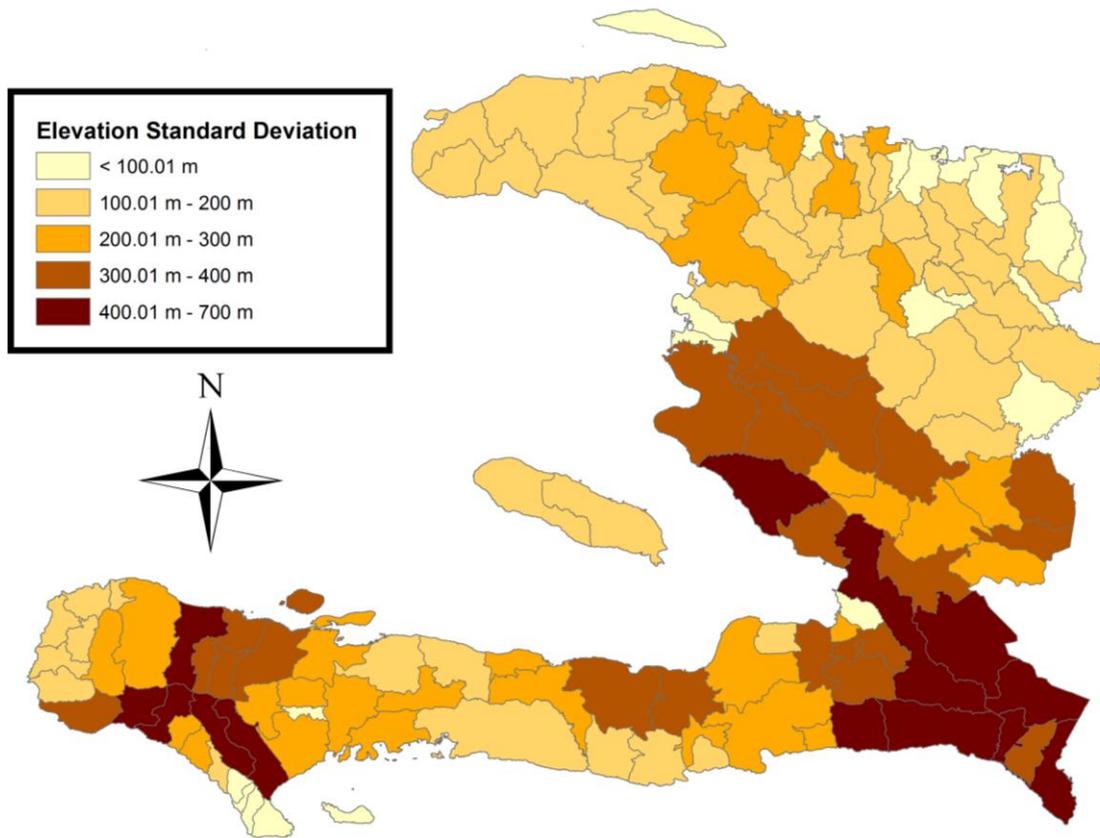


Figure 4-6. Standard deviation of elevation per commune in Haiti in meters.

Source: User creation using Mid-American Geospatial Information Center (MAGIC) data (MAGIC 2011)

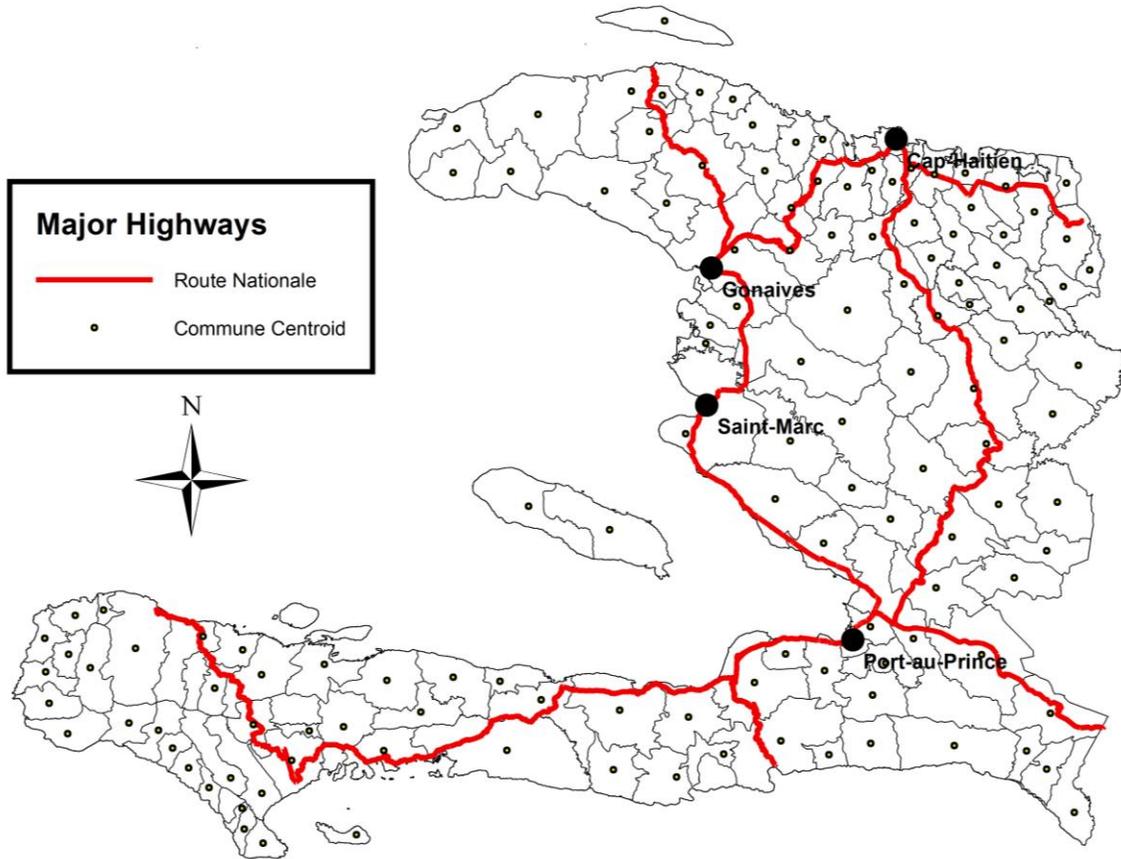


Figure 4-7. Route Nationale highway system in Haiti and commune centroids.

Source: User creation using Geocommons (GeoCommons 2010)

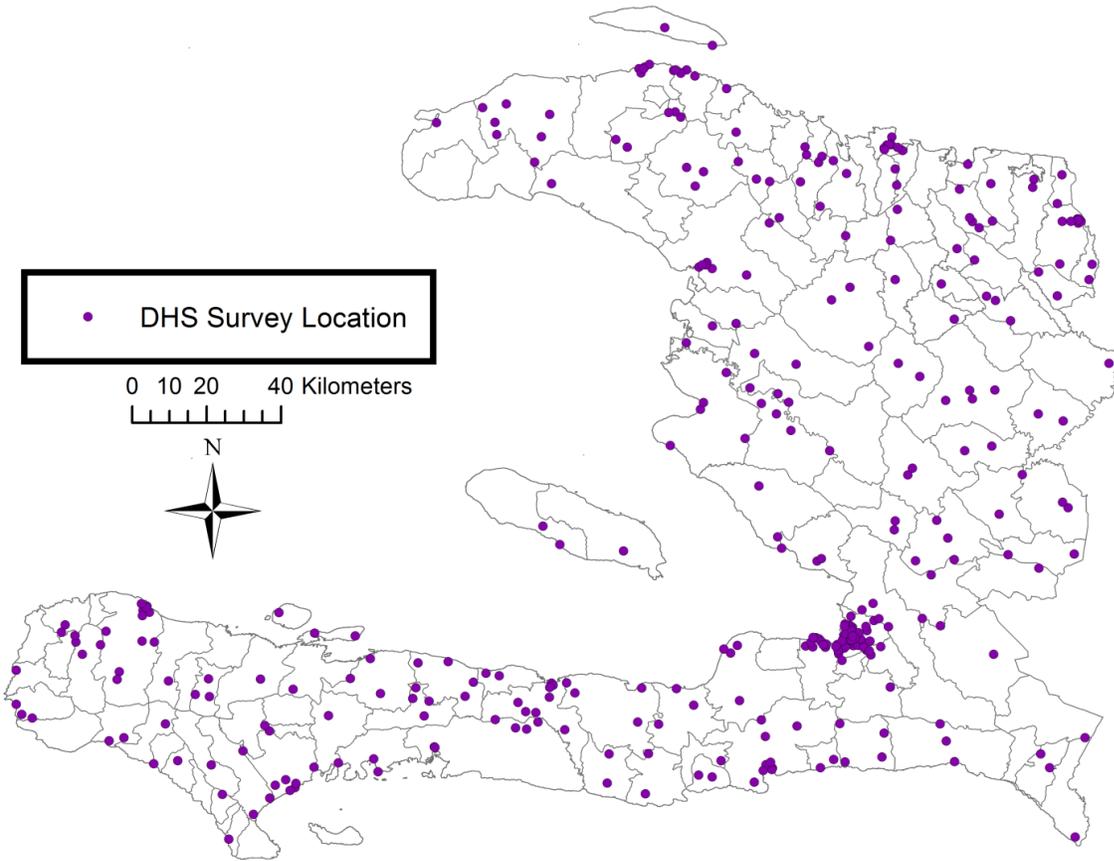


Figure 4-8. Approximate DHS survey locations in Haiti

Source: User creation using Demographic and Health Surveys (DHS) for Haiti (ICF International 2012)

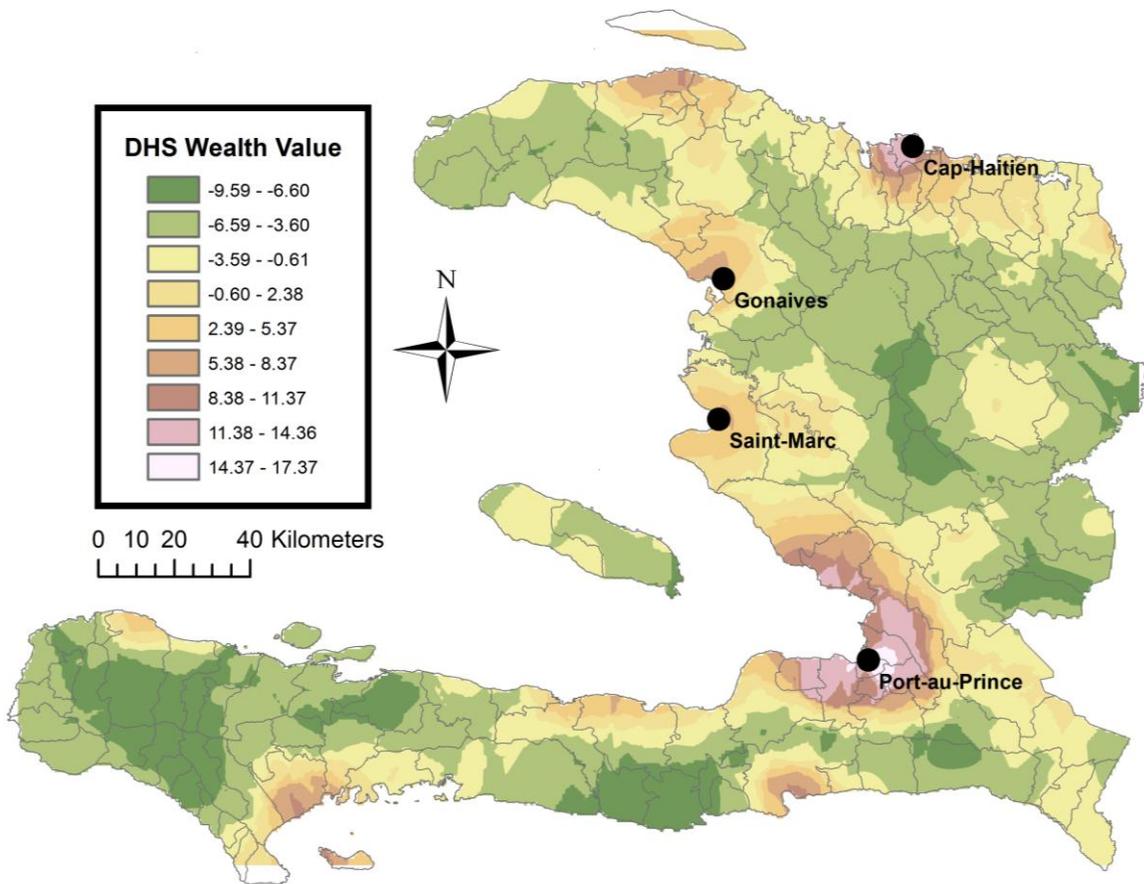


Figure 4-9. Estimated wealth distribution in Haiti using ordinary Kriging.

Source: User creation.

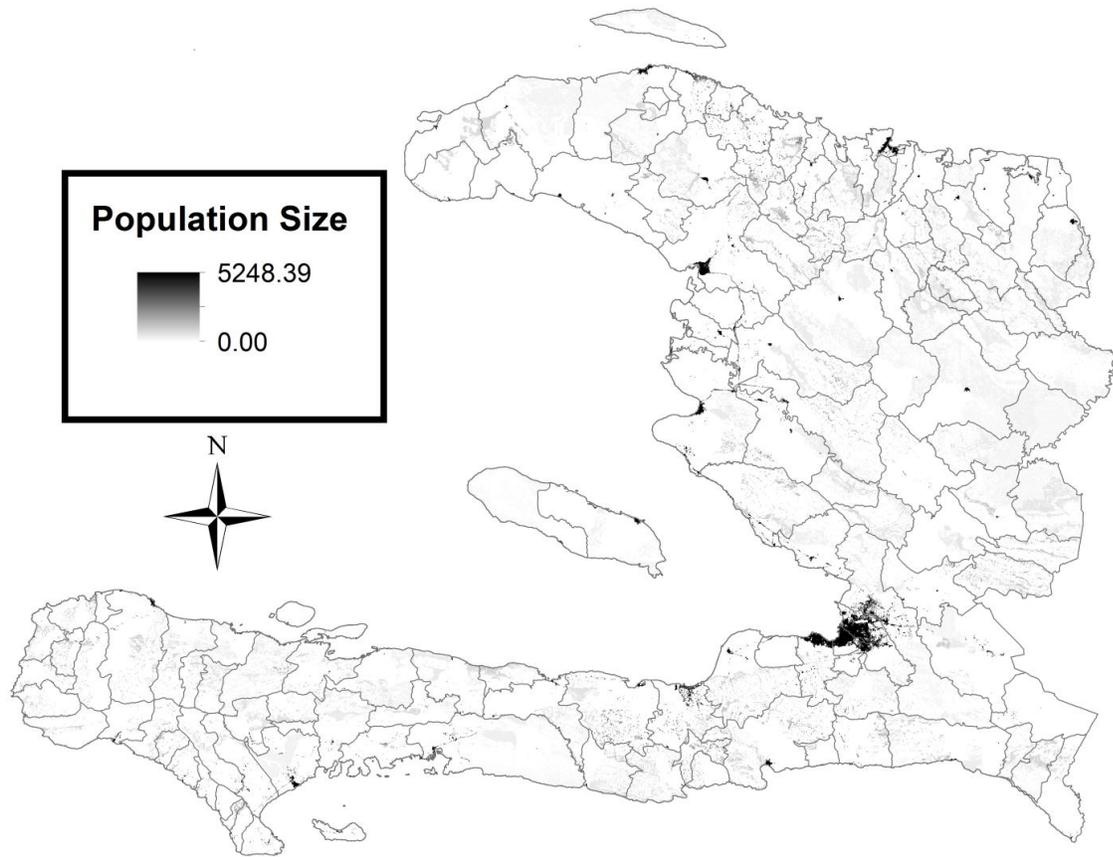


Figure 4-10. U.S. census database population estimate for Haiti.

Note: Cell size was set at a height of 0.1 kilometers times width of 0.1 kilometers.  
Source: User creation using U.S. Census demographic data (U.S. Census Bureau 2010).

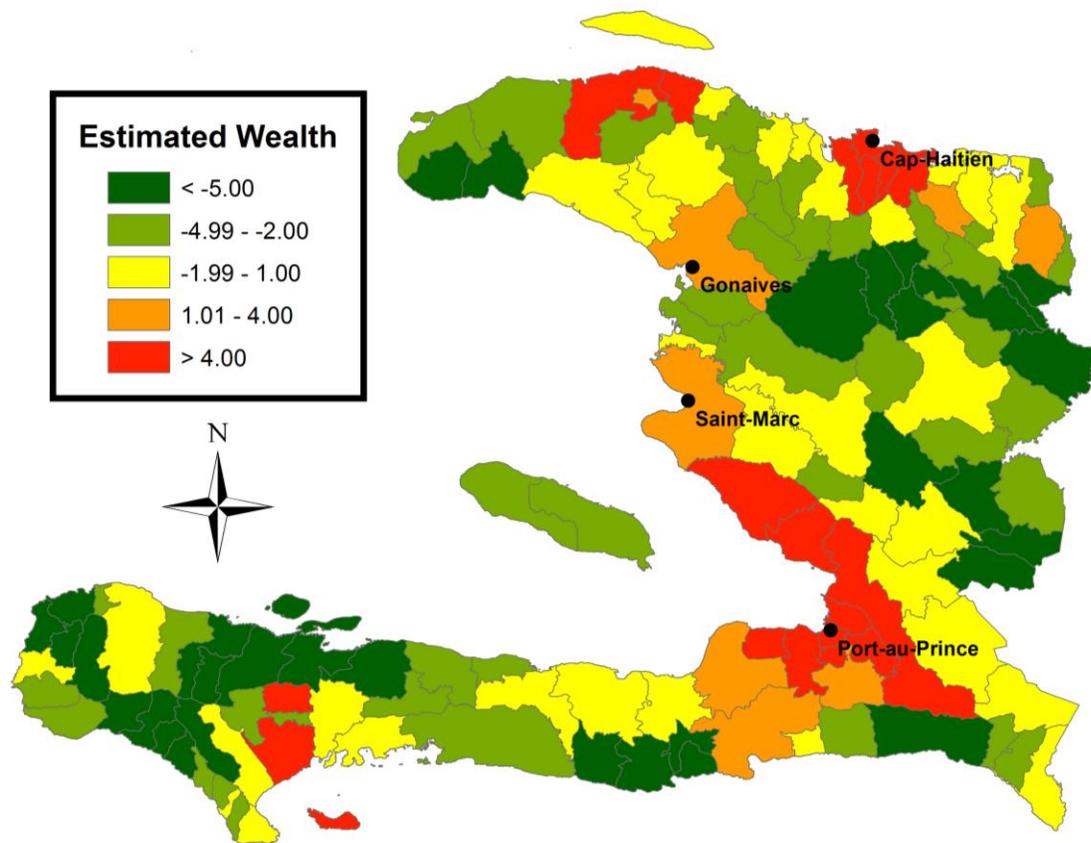


Figure 4-11. Estimated wealth value per commune in Haiti.

Source: User creation.

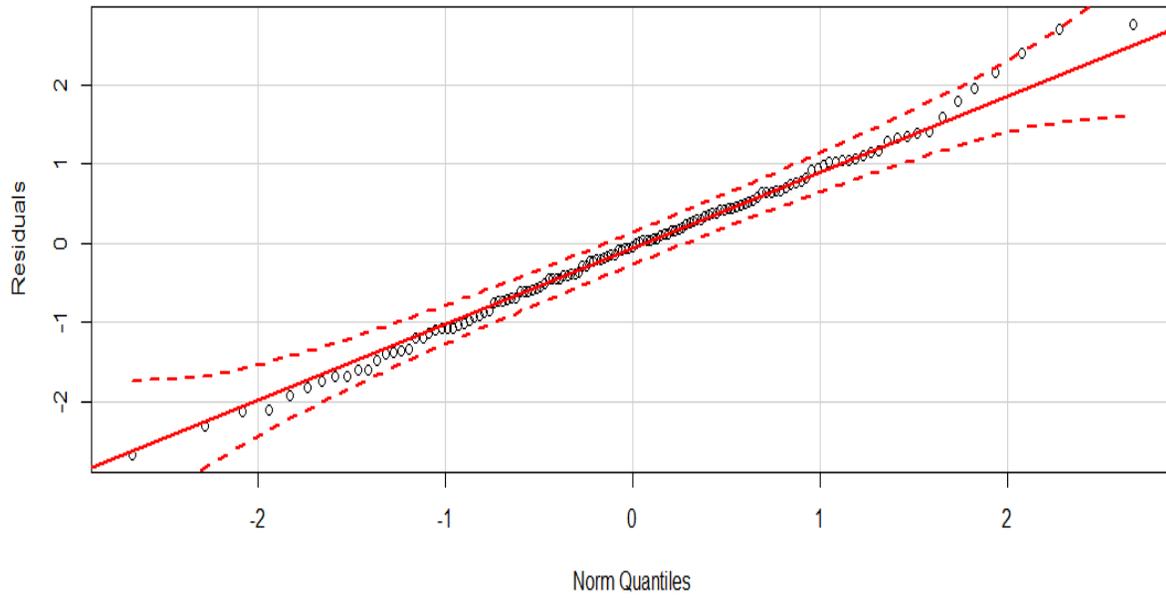


Figure 4-12. Randomized Quantile Residual.

Source: User creation.

## CHAPTER 5 DISCUSSION AND CONCLUSION

This research examines the spatial and temporal patterns of conflict and political violence in Haiti. It highlights and explains conflict dynamics in Haiti in an exhaustive manner, and identifies determinants of conflict and violence.

### **Summary of Results**

The temporal analysis of conflict identifies unique temporal patterns of conflict. Conflict intensity, in Haiti between 1997 and 2010, is incongruous. Two distinct periods of conflict existed in Haiti during this time period. Between September 2003 and June 2005, Haiti went through a successful coup d'état against President Aristide, the reigning President in Haiti between 2000 and 2004, and conflict remained high after the coup d'état. The ACLED measured high levels of conflict in this time period, and the period can be best characterized as a short, intense civil war.

Apart from the short, intense civil war period, Haiti experienced a long period of low-intensity continuous conflict. The ACLED indicates that violence and political conflict remained a constant aspect to political life in Haiti. Carrol Faubert described Haiti as a “a case of a lingering political and governance crisis accompanied by a severe degradation of the economy, of security and of livelihoods” (Faubert 2006). Conflict and violence have been instrumentalized by political actors frequently to accomplish their agenda and goals of gaining personal economic prosperity and wealth.

The temporal analysis of the ACLED also shines light on the security situation, during President Aristide's reign from 2000 to 2003. It has been claimed that “during Aristide's second administration Haiti was steeped in violence, as political factions and economic interests jockeyed for power” (Collaborative Learning Projects 2009).

However, the ACLED suggests that the levels of violence and political conflict had remained similar under President Aristide to the levels experienced under President Préval, who served as President from 1997 to 2000. No significant, sustained change in conflict intensity can be observed from 1997 to September 2003.

The ACLED for Haiti could certainly underestimate conflict levels experienced under President Aristide, and consequently misinform the analysis of conflict in Haiti. However, the temporal analysis of conflict data casts serious doubt that the security situation worsened significantly under President Aristide.

The spatial analysis of conflict highlights that significant spatial clustering of events exists in Haiti. Most of the political conflict and violence occurs in the greater metropolitan area of Port-au-Prince, Gonaïves, Saint-Marc, Cap-Haïtien, and Petit-Goâve. Conflict events are clustered in the major population centers of Haiti. An urban bias of conflict events exists, and conflict events are limited in rural areas of Haiti.

The spatial diffusion of conflict changed over time. Throughout the civil war, and really beginning in 2002, the diffusion of conflict events increased. The civil war period experienced a greater dispersion of conflict through Haiti. A violentization of the north of Haiti began in 2002, and continued until 2004. Interestingly, since 2005, the north of Haiti has experienced little political conflict and violence. The civil war in Haiti was a nationwide experience, whereas conflict has at times been relatively restricted to the greater metropolitan area of Port-au-Prince in years prior to and after the civil war.

The spatial diffusion is similar for different types of conflict. The geographic diffusion for protest, violence against civilians by armed groups, and battles between two armed groups does not vary much in the case of Haiti.

The deterministic analysis of conflict attempted to identify determinants of conflict and violence in Haiti. The general, global model, including all conflict events from 1997 to 2010, indicates that conflict propensity is greater in major population centers, in communes with departmental capitals, in closer proximity to Port-au-Prince, the capital, in closer proximity to the Route Nationale highway system, and in locations with lower elevation. Demographic, political, and military strategic factors impact conflict propensity in a given location. Surprisingly, average wealth levels and wealth distribution has no significant impact on conflict propensity in the general, global model of conflict in Haiti.

The analysis of conflict for the civil war period, and the continuous low-intensity conflict model show variations in the determinants of conflict for the two time periods. The civil war model of conflict is similar to the global model of conflict. Political, demographic, and military strategic reasons remain the main causes of conflict during the civil war time period. The wealth variable was almost significant at the five percent level; conflict propensity was greater in areas of low average wealth levels. The low-intensity continuous conflict model was markedly different from the two civil war and global model of conflict. The only significant determinant of low-intensity continuous conflict is the population size in a given location. Conflict propensity rises with population size.

The determinants of conflict for protest, violence against civilians by armed groups, and battles between two armed groups are similar. Protest, violence against civilians by armed groups, and battles between two armed groups is greater in communes with a departmental capital, and in commune with greater total population. Protest propensity rises with proximity to Port-au-Prince. The distance to the Route

Nationale highway system is a significant determinant of battles between two armed groups. Battles between two armed groups occur more frequently in close proximity to the Route Nationale highway system, but the distance to the Route Nationale highway system is not a significant determinant of conflict for the two other types of conflict tested.

Protest most commonly is a non-violent activity, whereas the other two event types are violent in nature. Even though this systematic difference exists, there is little variation in the determinants of the different types of conflict. The analysis indicates that conflict has similar root causes, which do not depend on how violent the conflict event itself is.

### **Suggestions for Future Research**

Disaggregated studies of conflict offer vital insights into the dynamics of conflict and violence. In our cases, the analysis of the ACLED, in combination with determinants, from various data sources, allowed an analysis of localized conflict in Haiti. However, just as in other disaggregated studies of conflict “limitation of data access make the modeling of violence” (O’Loughlin and Witmer 2011) challenging. Localized corruption, election, institutional, and in particular economic data could have enhanced the study of conflict in Haiti. Data access is the greatest challenge to studies of localized conflict.

Most disaggregated studies of conflict have studied localized conflict in Africa, with a limited number of studies focusing on Asia, Central Asia, and the Middle East. The focus on Africa has been primarily caused by the large number of civil wars and conflicts in the region. Since most studies have focused on African conflicts, conclusions about localized civil war dynamics have been frequently gained from

studies focusing on Africa. The study design employed in the analysis of conflict in Haiti is similar to the study design used by Hegre, Østby, and Raleigh in their analysis of conflict and civil war in Liberia (Hegre, Østby, and Raleigh 2009). Hegre, Østby, and Raleigh concluded “that conflict events are more frequent in locations that were absolutely and relatively well off in the Liberian context in 1986” (Hegre, Østby, and Raleigh 2009). In our analysis of conflict in Haiti, the wealth variable was only significant in the civil war model, and conflict propensity was greater in relatively poor areas of the country. In the general, global model and the continuous low-intensity conflict model the wealth variable was not significant.

The localized study of conflict in Liberia and Haiti used a similar methodological approach, but arrives at different conclusions about the impact of wealth on conflict propensity. Conflict dynamics must not necessarily be similar in different geographic regions of the world, and can even vary significantly for two neighboring countries. Additionally, in Haiti the set of determinants for the civil war model was different from the set of determinants in the low-intensity constant conflict model. General conclusion about all civil wars and conflict based on a single study or group of related studies must be avoided. Determinants of conflict can be context specific, varying for different geographic regions, and determinants can be time varying even for the same geographic area. It is unclear how time- and location-specific determinants of conflict are, and further research answering this basic question would be of immense value.

Our research in Haiti indicates a change in spatial diffusion of conflict, as conflict intensity rises. A possible link between conflict intensity and conflict diffusion could

exist. A further exploration of a general model of conflict diffusion and conflict intensity would be of great benefit to further understand conflict dynamics.

## APPENDIX A EWMA METHODOLOGY

“The Exponentially Weighted Moving Average (EWMA) is a statistic for monitoring the process that averages the data in a way that gives less and less weight to data as they are further removed in time” (Engineering Statistics Handbook). The EWMA is mathematically defined in the following way:

$$Z_i = \lambda \sum_{j=0}^{i-1} (1 - \lambda)^j Y_{i-j} + (1 - \lambda)^i Z_0, \quad (\text{A-1})$$

where  $Y_{i-j}$  is the event count for each individual month,  $\lambda$  is “is a constant that determines the depth of memory of the EWMA” (Engineering Statistics Handbook), which is referred to as the weighting factor or smoothing parameter,  $Z_0$  is the “starting value” (Lucas and Saccucci 1990) or target value. The greater the value of  $\lambda$  the stronger more recent observations influence the EWMA statistics. A value of  $\lambda = 1$  would imply that only the most recent observations are accounted for. The choice of “ $\lambda$  is usually set between 0.2 and 0.3 although this choice is somewhat arbitrary” (NIST/SEMATECH 2012).

The Exponential Weighted Moving Average control scheme “has upper control limits (UCL’s) and lower control limits (LCL’s)” (NIST/SEMATECH 2012). If the EWMA statistics exceeds the UCL’s or LCL’s, the process has shifted, and is out of control at that point. The UCL’s and LCL’s are defined in the following way:

$$\text{UCL's} = Z_0 + k * s_{ewma} \quad (\text{A-2})$$

$$\text{LCL's} = Z_0 - k * s_{ewma}, \quad (\text{A-3})$$

- $Z_0$  is the “starting value” (Lucas and Saccucci 1990) or target value.
- $S_{ewma}$  is the standard deviation of the EWMA statistic
- $k$  is a parameter “set equal 3” (NIST/SEMATECH 2012) in most cases.

The variance of the EWMA statistic is defined in the following way:

$$s^2 (Z_i) = \{[1 - (1 - \lambda)^{2i}]\lambda / (2 - \lambda)\} s^2 , \quad (\text{A-4})$$

where  $s$  is the standard deviation of the historical data. “Unless  $\lambda$  is small, the effect of the starting value soon dissipates and the variance quickly converges to its asymptotic value” (Lucas and Saccucci 1990):

$$s^2 (Z_i) = \{\lambda / (2 - \lambda)\} s^2. \quad (\text{A-5})$$

The EWMA statistics measures the cumulative deviations over time from the target value. If the EWMA statistics exceeds the UCL's or falls below the LCL's, the process is out of control, and if the EWMA remains within the control limits the process is in control. The EWMA detects the mean value of a variable of interest changing.

APPENDIX B  
GLOBAL MORAN'S I STATISTIC

The global Moran's I statistic detects spatial autocorrelation in a variable of interest. The global Moran's I is mathematically defined in the following way:

$$I = \frac{n \sum_{i=1}^n \sum_{j=1}^n w_{ij} (X_i - \bar{X})(X_j - \bar{X})}{\sum_{i=1}^n \sum_{j=1}^n w_{ij} \sum_{i=1}^n (X_i - \bar{X})^2}, \quad (\text{B-1})$$

Where n is equal to the number of areas or polygons,  $\bar{X}$  is the mean of the variable of interest,  $X_i$  is the value of the variable of interest in a given polygon or area, and  $X_j$  is the value of interest in another polygon or area.  $W_{ij}$  is a spatial weight matrix of i relative to j. A spatial weight matrix measures the relative location of all points i and j, and determines the relationship and pattern between various areas and polygons.

The Moran's I test score is then compared to a random and expected spatial distribution to detect "a significant departure from randomness" (Burt, Barber, and Rigby 2009). An index is created, which represent the expected distribution under randomness:

$$E(I) = \frac{-1}{n-1} \quad (\text{B-4})$$

As the number of observations rises, the expected values of Moran's I approaches zero.

The variance is then defined as:

$$Var(I) = \frac{n^2 B - nC + 3A^2}{A^2(n^2 - 1)} \quad (\text{B-5})$$

where,

$$A = \sum_{i=1}^n \sum_{j=1}^n w_{ij} \quad (\text{B-6})$$

$$B = \sum_{i=1}^n \sum_{j=1}^n w^2_{ij} \quad (\text{B-7})$$

$$C = \sum_{i=1}^n (\sum_{j=1}^n w^2_{ij}) \quad (\text{B-8})$$

The test statistic is then defined as being based:

$$Z = \frac{I - E(I)}{\sigma_I} \quad (\text{B-9})$$

The Global Moran's I calculates a Z score that compares the spatial distribution of a variable to a spatial distribution of the same variable under randomness. If the observed value of "Moran's I is greater than the expected value" (Burt, Barber, and Rigby 2009), the data exhibits positive spatial autocorrelation. If the Moran's I score is less than the expected value, the data exhibits negative spatial autocorrelation.

APPENDIX C  
LOCAL INDICATOR OF SPATIAL ASSOCIATION– LOCAL MORAN’S I SCORE

Local indicators of spatial association (LISA) identify “local spatial clusters”(Anselin 1995) and hotspots. LISA help to recognize “areas where values of a variable are significantly greater or significantly lower than average” (Burt, Barber, and Rigby 2009). The local Moran’s I score for a given area is:

$$I_i = \frac{x_i - \bar{X}}{S_i^2} \sum_{j=1, i \neq j}^n w_{ij} (x_j - \bar{X}), \quad (C-1)$$

where

- $x_i$  is the value of a variable of interest in a given area i.
- $\bar{X}$  is the overall mean of the variable of interest.
- $w_{ij}$  is the spatial matrix defining the spatial relationship between various areas.
- $S_i^2 = \frac{\sum_{j=1, i \neq j}^n (x_j - \bar{X})^2}{n-1} - \bar{X}^2$ , where n is the total number of areas included.

Additionally, the Z-Score for the Local Moran’s I is defined as:

$$z_{I_i} = \frac{I_i - E[I_i]}{\sqrt{V[I_i]}}, \quad (C-2)$$

where

$$E[I_i] = - \frac{\sum_{j=1, i \neq j}^n w_{ij}}{n-1} \quad (C-3)$$

$$V[I_i] = E[I_i^2] - E[I_i]^2 \quad (C-4)$$

The Local Moran’s I statistic can be understood in the same way as the Global Moran’s I. If the Local Moran’s I score for an area is positive, it indicates that “spatial clustering of similar values (either high or low)” (Anselin 1995) occurs. If the local Moran’s I for an area is negative, it indicates that spatial “clustering of dissimilar values occurs (for example, a location with high values surrounded by neighbors with low values)” (Anselin 1995).

APPENDIX D  
MEAN CENTER AND STANDARD DEVIATIONAL ELLIPSES

The mean center of spatial data “identifies the geographical center (or center of concentration) for a set of features” (ESRI 2011c). It is derived by calculating the “average x and y coordinates of all the features in the study area” (ESRI 2011c):

$$\bar{X} = \frac{\sum_{i=1}^n x_i}{n}, \quad (D-1)$$

$$\bar{Y} = \frac{\sum_{i=1}^n y_i}{n}. \quad (D-2)$$

The mean center identifies changes or variations in the spatial distribution of data tracking the central or average location. A standard deviational ellipse “calculates the standard deviation of the x-coordinates and y-coordinates from the mean center to define the axes of the ellipse”(ESRI 2011d). The standard deviational ellipses can assess the spatial diffusion of data, and track the variation in geographical dispersion for different sets of data, or over time. The standard deviational ellipse is defined as:

$$SDE_x = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{X})^2}{n}}, \quad (D-3)$$

$$SDE_y = \sqrt{\frac{\sum_{i=1}^n (y_i - \bar{Y})^2}{n}}, \quad (D-4)$$

where  $x_i$  and  $y_i$  represent the coordinate of the feature  $i$ , and  $\bar{X}$  and  $\bar{Y}$  are the mean center of the feature. The angle of rotation is calculated in the following way:

$$\tan \theta = \frac{A+B}{C} \quad (D-5)$$

$$A = (\sum_{i=1}^n \tilde{x}_i^2 - \sum_{i=1}^n \tilde{y}_i^2) \quad (D-6)$$

$$B = \sqrt{(\sum_{i=1}^n \tilde{x}_i^2 - \sum_{i=1}^n \tilde{y}_i^2)^2 + 4(\sum_{i=1}^n \tilde{x}_i \tilde{y}_i)^2} \quad (D-7)$$

$$C = 2 \sum_{i=1}^n \tilde{x}_i \tilde{y}_i \quad (D-8)$$

where " $\tilde{x}_i$  and  $\tilde{y}_i$  are deviations of the xy-coordinates of the mean center" (ESRI 2011d).

The standard deviational ellipse creates an ellipse that shows the deviations of the observations from the center for both x and y coordinates. "The orientation represents the rotation of the long axis measured clockwise from north" (ESRI 2011d). The orientation of the ellipse indicates the direction and orientation of the data.

APPENDIX E  
NEGATIVE BINOMIAL GENERALIZED LINEAR MODEL

The negative binomial regression model uses count data with overdispersion; overdispersion in data occurs when the variance of the data exceeds the mean of the data. The negative binomial regression model has a flexible distribution to account for overdispersed data:

$$\Pr(Y = y|\lambda, \alpha) = \frac{\Gamma(y + \alpha^{-1})}{y! \Gamma(\alpha^{-1})} \left[ \frac{\alpha^{-1}}{\alpha^{-1} + \lambda} \right]^{\alpha^{-1}} \left[ \frac{\lambda}{\alpha^{-1} + \lambda} \right]^y \quad (\text{E-1})$$

where  $\lambda$  is the mean or expected value of the distribution, and  $\alpha$  is the dispersion parameter. The dispersion factor is estimated, and not a priori known.

The log-likelihood function for the negative binomial regression model is then defined as:

$$L(\beta|y, X) = \prod_{i=1}^N \Pr(y_i|x_i) = \prod_{i=1}^N \frac{\Gamma(y_i + \alpha^{-1})}{y_i! \Gamma(\alpha^{-1})} \left[ \frac{\alpha^{-1}}{\alpha^{-1} + \lambda} \right]^{\alpha^{-1}} \left[ \frac{\lambda}{\alpha^{-1} + \lambda} \right]^{y_i} \quad (\text{E-2})$$

$$\text{where } \mu = E(y_i|x_i) = \exp(x_i\beta) . \quad (\text{E-3})$$

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