# South and Central American Guerrilla Groups

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## 1 Introduction

Our goal is to compare and contrast the way various terrorist groups operate. To do so, we selected four groups: Shining Path (SL), Farabundo Marti National Liberation Front (FMLN), Revolutionary Armed Forces of Colombia (FARC), and National Liberation Army of Colombia (ELN).

We used several criteria to narrow down our choice: (i) each of these groups operates in South America, (ii) the stated purposes these groups are very similar, and (iii) there are enough data points to allow us to analyze these groups. (i) and (ii) are important because they ensure that things such as different culture, climate, level of prosperity, terrain, political situation, purpose of the group et cetera will be held constant. Since there will be fewer lurking variables, we can be more confident that any differences between the groups are a matter of choice, not circumstance.

In section 2, we explore the idea of combining the two Colombian groups, Revolutionary Armed Forces of Colombia (FARC) and National Liberation Army of Colombia (ELN) into ELN/FARC in order to make the

number of entries for each organization more comparable. Moreover, since Colombia is a larger country than Peru and El Salvador, combining its two major terrorist organizations might allow us to gauge the level of terrorism in Colombia more accurately.

In section 3, we investigate the differences in level of violence between the groups. We present evidence suggesting that, on average, some groups kill and wounds more people per attack. We also focus on the usage of what kind of weapons results in most deaths; whether groups have a preference for some particular type of weapons; which cities suffered from most attacks.

In section 4, we look for patterns in the nationality of terrorist groups' targets; the relationship between the anti-terrorist spending and terrorist activity, and the types of the target each group chooses. We also analyze the relationship between government anti-terrorism funding and the activity level of the terrorist groups. Moreover, we show that the groups we investigated choose to use two types of weapons (explosives and firearms) in the vast majority of cases.

## 2 Colombian Revolutionary Organizations

### 2.1 Introduce the Groups

The two groups within Colombia that we focused our analysis on are the National Liberation Army of Colombia (ELN) and the Revolutionary Armed Forces of Colombia (FARC). A major reason for our collapsing the two Colombian guerilla groups into a single entity is due to the fact that they often worked together to attack civilian and military populations in order to spread their beliefs[1]. Also, FARC has about three times as many active members (as of 2012) at an estimated 15,000[2]. Finally, as both are fundamentally Marxist/Liberation movements that claim to represent the poor peasant class, they have similar concerns and goals, namely:

1. Criticism of income inequality among classes in Colombia.
2. Distaste of US influence in Colombian legislature.
3. Fighting against monopolization and transnational corporations exploiting their control on natural resources.
4. General "liberation" of the peasant/poor class in rural areas from oppressive and indifferent political institutions.

While the political ideologies of the two groups aligned and the two groups combined their efforts in certain situations, there a few key differences in their methodologies, although this idea will be explored in much more depth in later sections. For one, the ELN is notorious for their ransom kidnappings[3] while the FARC has had a significant amount of their funding done through gold mining and drug production and trade[4].

### 2.2 Comparison

Interestingly enough, both groups were founded in 1964 as Marxist/Socialist movements - a theme that seems to be persistent in many South and Latin American countries. In light of this, we zoned in on the mid 80s - 90s since this was a period of global turmoil related to Communist ideologies (specifically the collapse of Communism in Eastern Europe).

[1] http://www.dailykos.com/story/2007/02/06/298812/-FARC-vs-ELN-in-Colombia
[2] http://www.ft.com/home/us
[3] http://www.economist.com/news/americas/21570701-second-biggest-guerrilla-group-tries-muscle-peace-talks-fear-missing-out
[4] http://www.bbc.co.uk/news/world-latin-america-18396920

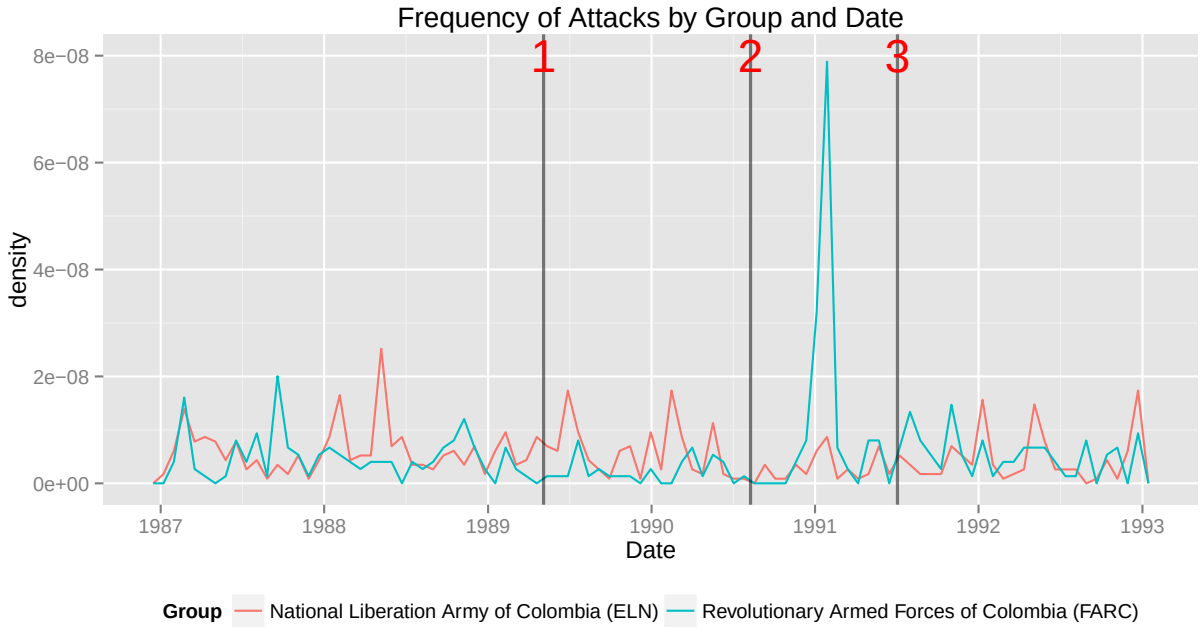


Figure 1: The above graph shows the frequency of terrorist attacks of the two main Colombian guerrilla groups along with some important dates

Table 1: Important Dates

| Label | Date | Event |
|---|---|---|
| 1 | 1989-05-05 | Collapse of communism in Europe. |
| 2 | 1990-08-10 | Colombian army attacked a FARC base during negotiations. |
| 3 | 1991-07-04 | Constitution of 1991. |

A basic sinusoidal pattern immediately jumps out from this plot. We can quickly observe that the frequency of attacks rise and fall periodically which goes alongside our intuition since attacks take planning and resources and cannot be sustained at a constant rate. The plot also draws our attention to the fact that there does not seem to be any sort of influx of terrorist attacks around the time when communism collapsed in Eastern Europe. Although Colombia and Eastern Europe have a significant geographical and cultural difference, we reckoned that the Marxist roots of both groups of people might cause some sort of signal response to a significant event occurring to the other group.

Labels 2 and 3 are where we begin to see some actual perceptive responses of the data to historical events. Following a long period of ceasefire and peace talks, thousands of FARC members were slaughtered by the Colombian government with supposedly no advanced warning[5]. Immediately following this, we see an enormous spike in the frequency of terrorist attacks committed by the FARC. At label 3, we have the date when the Colombian Constitution of 1991 was instituted[6]. The main motivation behind the promulgation of the new Constitution was to answer the demands of many Colombian citizens and was said to follow a period

[5]http://www.cnn.com/2012/08/28/world/americas/colombia-farc-facts
[6]http://www.elespectador.com/impreso/temadeldia/articulo-281784-el-arduo-camino-de-constituyente-de-1991

of heightened violence. This exact response is clearly detailed in Figure 1 with a period of frequent violence being mellowed out after political changes were implemented. Fortunately, we now we have some evidence to suggest that our dataset isn't biased towards different time periods in its recording of terrorist incidents. For several important dates in Colombia's history with the two guerrilla groups we see the appropriate response detailed by the GTD dataset.

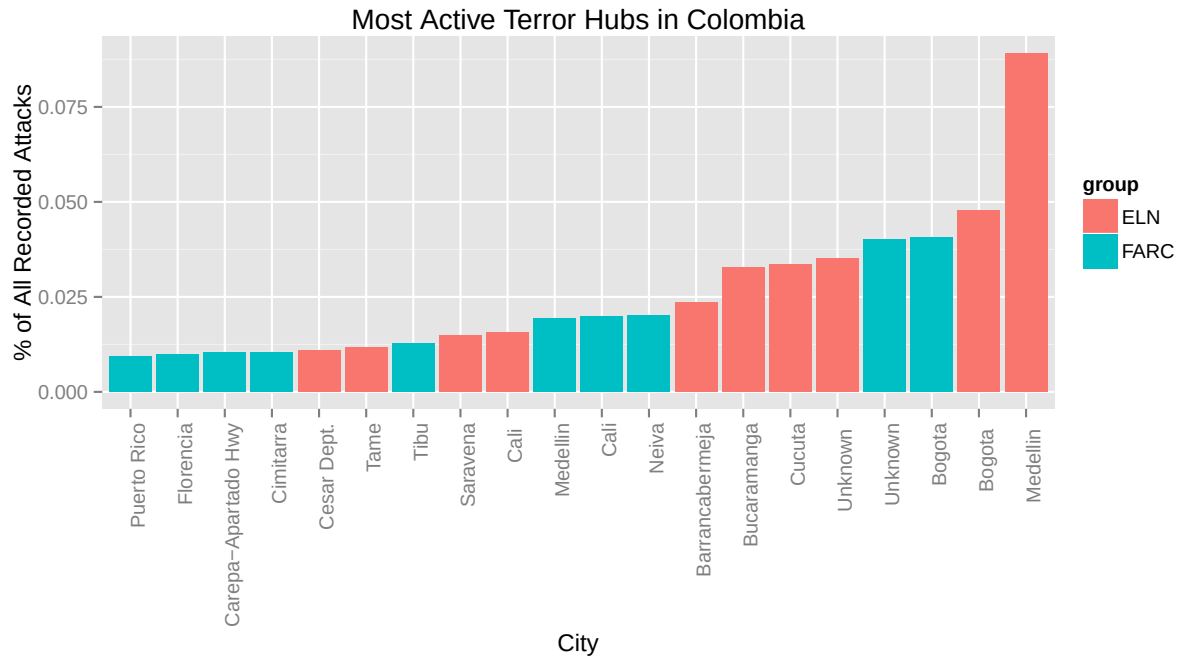


Figure 2: The above graph shows the frequency of terrorist attacks of the two main Colombian guerrilla groups of their 10 most frequently attacked cities.

The most immediate thing we can ascertain from Figure 2 is that the FARC seems to be a lot more spread out than their counterparts. The city that most frequently hosts terrorist activity for the ELN is Medellin, with about 8% of all recorded attacks happening there. Bogota is a pretty popular target for both groups which follows naturally from the fact that Bogota is the nation's capital and both groups primarily have political agendas. In addition, we chose to include the "Unknown" city in our graphical presentation in order to highlight the fact that both groups are missing a comparable proportion of their city data. All in all, we see that FARC has a more widespread and decentralized operation as compared to ELN. In order to explore some of the geographic differences between the two groups, we resorted to a map based on latitude and longitude that was collected from an online source[7] since the GTD dataset was missing all longitude and latitude location for Colombia.

Figure 3 gives us a basic idea of where each group operated. Both groups had extensive mainland operations in Cali, Bogota, and Medellin. They differed in that ELN tended to have more of their activity on the northeast border with Venezuela while FARC was active in the south-central region.

[7]http://www.travelmath.com/

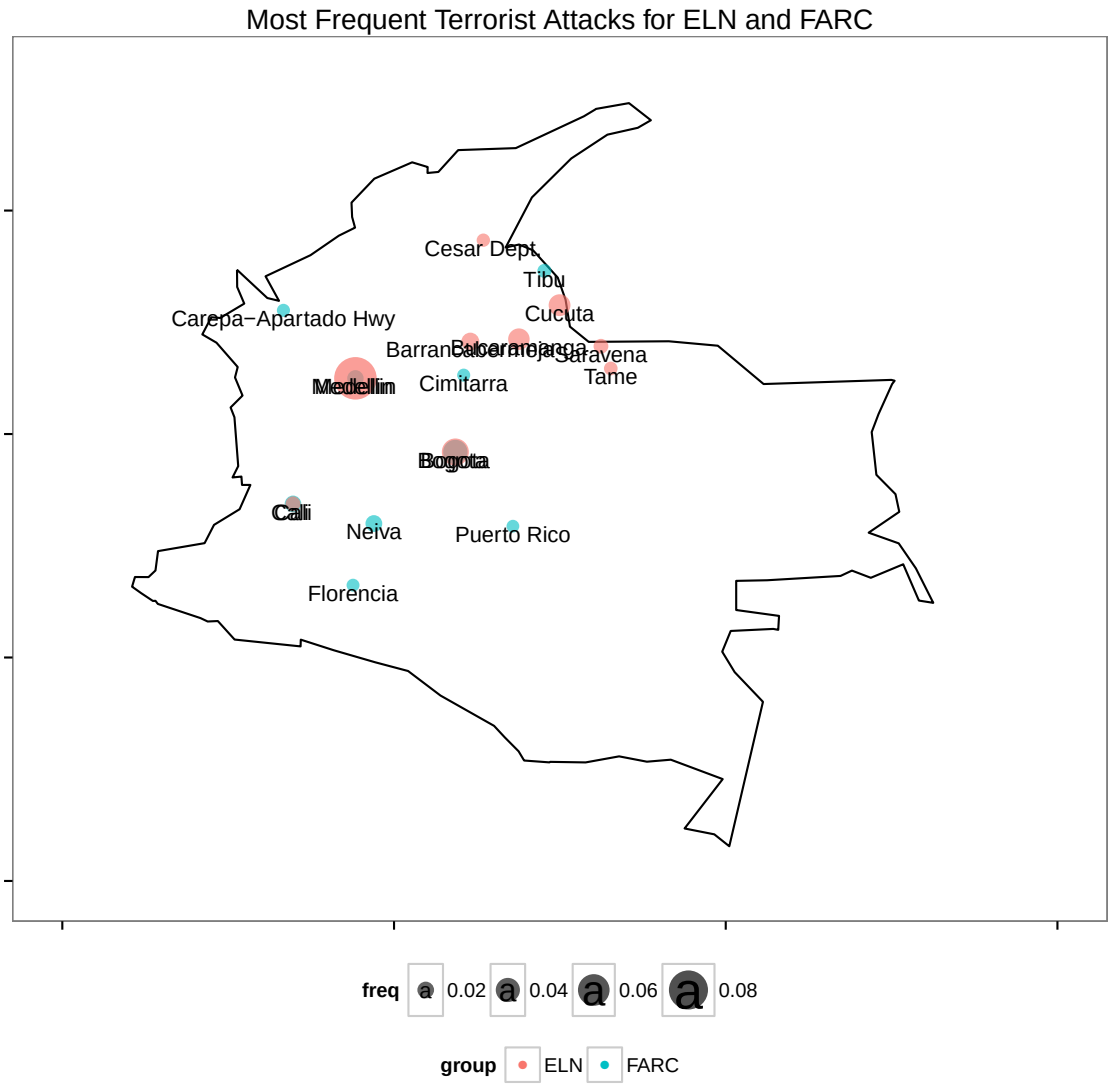


Figure 3: The above map shows the cities in which terrorist attacks most frequently committed by ELN and FARC. The size of each point corresponds to frequency while color corresponds to group. Additionally, alpha level is carefully set in order to show overlapping cities.

# 3 Violence

## 3.1 Cleaning Up the Data

For all the tables and plots below, the original Global Terrorism Database was subseted to include only four terrorist organizations: Shining Path (SL), Farabundo Marti National Liberation Front (FMLN), Revolutionary Armed Forces of Colombia (FARC), and National Liberation Army of Colombia (ELN). For the reasons outlayed in the secion 1, we decided that the data for the two Colombian groups should be combined, and are presented here as ELN/FARC.

We focused on two variables as a measure of violence: nkill and nwound. The former accounts for all the casualties in a given event, while the latter accounts for all the wounded (each includes both terrorists and the victims). We decided against using nkillus (United States citizens killed) or nkillter (terrorists killed) because too much data was missing.

We removed all the entries with NA's for the following variables: 'nkill', 'nwound', 'weaptype1', and, in subsection 3.5, for 'city.'. Moreover, to obtain the numbers for both tables in 3.3, the dataset was further divided into three, one for each group.

## 3.2 Pattern of Violence Over Time

Figure 4 gives an overview of the period over which each group was active. FMLN and SL both commenced their operation in early 80s. The latter stopped functioning in the early 90s, while the latter stopped conducting frequent, large-scale operations in mid-90s, with very sporadic activity until the present day. ELN/FARC has been operational since mid-70s.

The figure plots year against the total number of killed and wounded in each attack. Each group conducted numerous attacks with fairly low number of killed and casualties (overall, roughly half of the events resulted in no killed or wounded).However, ELN/FARC's attacks rarely resulted in high number of victims. SL and FMLN had significantly more events with the total hovering around 50 as well as several high-victim-count outliers.

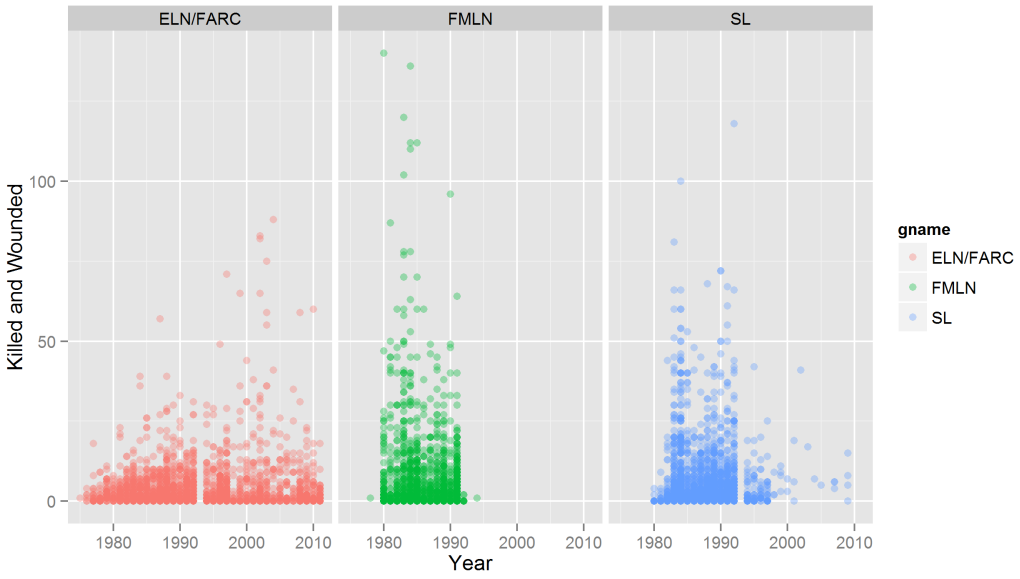


Figure 4: The figure shows the number of wounded in each of the attacks and by each group in the 1972-2011 period.

### 3.3 Which Terrorist Group is the Deadliest?

In order to make the information about the number of killed and wounded more comparable between the three groups, we calculated ratios of killed and wounded per terrorist attack. An attack by SL, on average, resulted in 2.77 killed and 3.27 wounded. ELN/FARC, with 1.90 killed and 1.45 wounded per attack is the least violent of the groups.

| | Killed per event | Wounded per event |
|---|---|---|
| ELN/FARC | 1.90 | 1.45 |
| FMLN | 2.91 | 1.60 |
| SL | 2.77 | 3.27 |

If we look at the period of the activity of each group, FMLN (462 killed and 253.25 wounded per year) and SL (379.97 killed and 447.25 wounded per year) emerge as the most violent ones. ELN/FARC's 150 killed and 115 wounded per year, combined with low killed and wounded per event numbers from the table above suggests that not only were their attacks less violent, but also much less frequent.

| | Killed per year of activity | Wounded per year of activity |
|---|---|---|
| ELN/FARC | 149.69 | 114.56 |
| FMLN | 462.00 | 253.25 |
| SL | 379.97 | 447.52 |

### 3.4 Most Lethal Weapons and Groups' Preferences

Chemical weapons were by far the most lethal-when used, roughly 8 people were killed. The usage of firearms and melee weapons resulted in about 5 and 4 deaths. Explosives resulted in surprisingly few dead and wounded. Our expectation was that explosives would have much higher casualty rate since they have the potential to kill a very large number of people when used. This suggests that it was mostly used with the intention to destroy infrastructure, not kill people.

We can see the preference of each group for each weapon type. Almost all deaths and all wounds inflicted by chemical weapon were the responsibility of ELN/FARC. The majority of deaths and wounds caused by explosives and incendiary weapons were also caused by them. In contrast to ELN/FARC, SL and FMLN preferred to use more traditional weapons-firearms and melee. SL was the only group to use sabotage equipment.

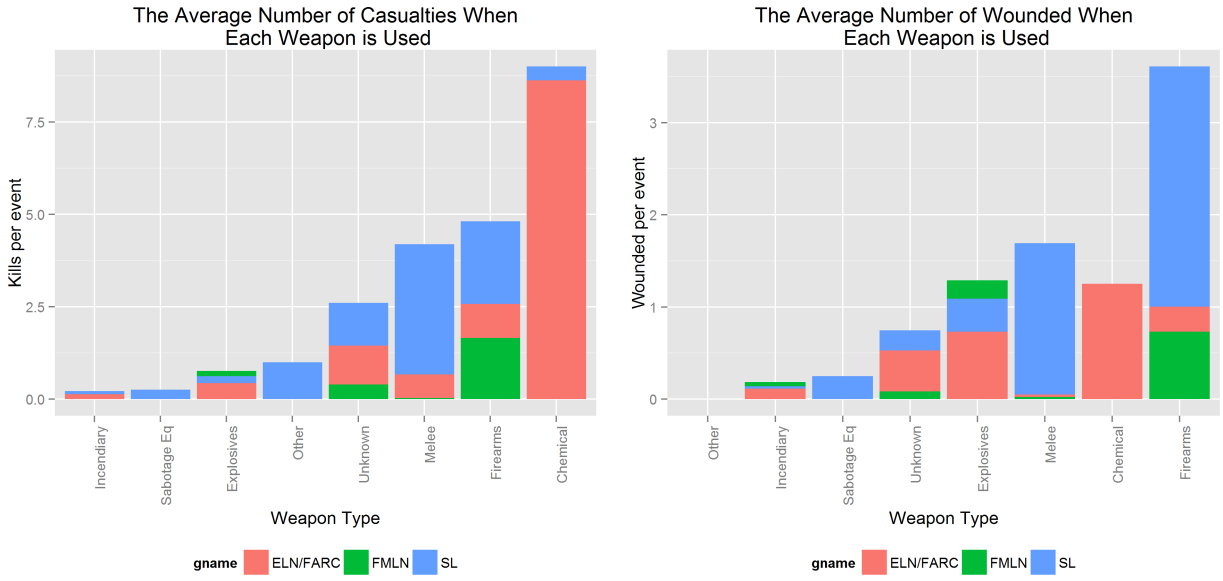


Figure 5: The left figure shows how many people were killed each time a particular weapon was used and for what proportion is each group responsible. The plot on the left shows how many people were wounded each time a particular weapon was used and for what proportion is each group responsible.

### 3.5 Which Cities Suffered the Most?

According to figure 6(left), significant proportion of SL's attacks took place in Lima, Huancayo, and Ayacucho, which is consistent with SL's history. The group was founded at a university in Huancayo, and later developed a significant presence and a solid base at universities in Lima and Ayacucho. The disproportionately high number of attacks in Lima was most likely caused by the sheer size of the city-during the 1980s and early-to-mid 90s it increased its population by almost 2.5 million to reach the size of nearly six million people in 1997.

San Salvador, in spite being many times smaller than Lima, was the host to half as many attacks. El Salvador's capital and only major city, San Salvador was in effect the only possible target for many of the FMLN's attacks (in 1980 the whole country of El Salvador had lower population than the city of Lima).

ELN/FARC's choice of targets stands in a stark contrast to the other groups. Medellin, Bogota, and Cali are the three largest Colombian cities. For all of the groups' existence, they were rapidly developing cities. However, only about 500-600 of the attacks were conducted in these cities, which shows that ELN/FARC's was much more geographically spread out and more inclined to organize attacks in mid-size cities and rural areas then both SL and FMLN's.

Figure 6(right) reveals two interesting facts. First, the attacks with the highest casualty count took place mostly in small and mid-size cities. There is no overlap between cities in figures 6. This suggests that the cities that are rarely subject to terrorist attacks might be more vulnerable to large-scale assaults than cities, which deal with terrorism on regular basis. Seconds, almost all of these attacks were orchestrated by FMLN. According to the first table in 3.3, FMLN has the highest 'killed per event' ratio. The fact that they were responsible for most high-casualty attacks suggests that, compared to other groups, there might be more variability in the number of victims of their attacks.

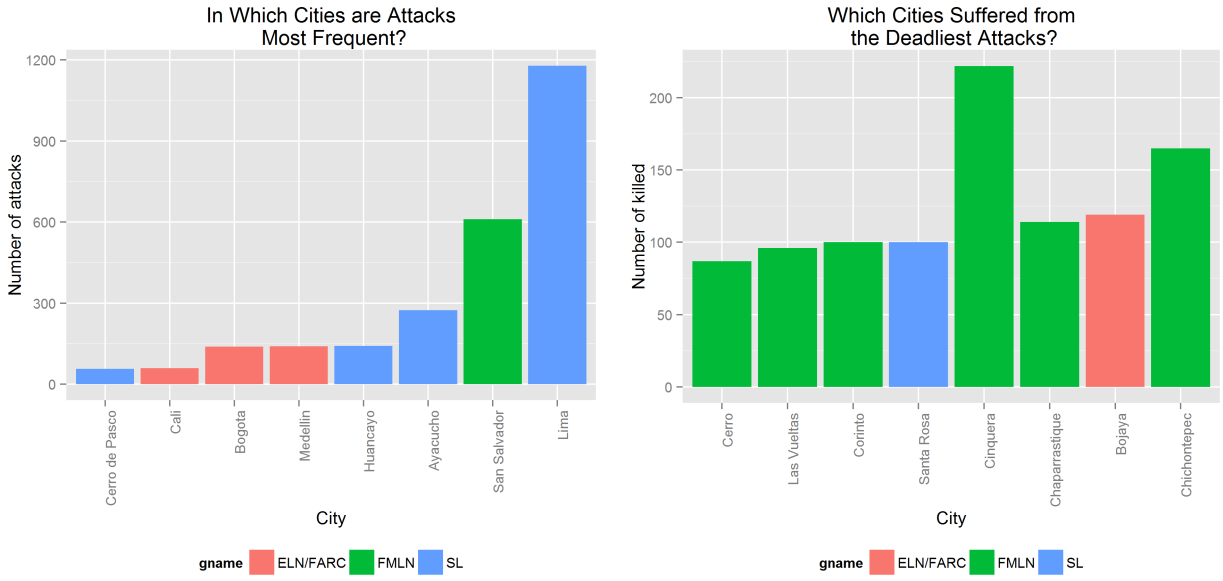


Figure 6: The left figure shows which cities were most frequent targets of terrorist attacks and which groups conducted them. Extending from that idea, the left plot illustrates in which cities the attacks with most casualties occured. Note: there were two attacks in Cinquera. One resulted in 102 casualties, the other in 120. In the plot above, the average (111 casualties) is taken into consideration.

### 3.6 Possible Explanation for Varying Levels of Violence

Violence is a complex phenomenon and it is influenced by many factors. While not exhaustive, we believe the following list contains arguments that are a part of the explanation:

- During 1980s FMLN was, on several occasions, in a de facto war with the government, which is consistent with many high-casualty events and a frequent use of firearms.
- SL was also actively fighting the government for roughly a decade. However, they operated mostly in the countryside and on the outskirts of Lima. Moreover, they frequently assassinated specific political and military figures, which is consistent with high levels of killed and wounded, but no incidents among the largest massacres.
- In spite of being actively opposed to the Colombian government, ELN/ FARC was in some form of negotiations with the authorities for most of the time. This resulted in some periods of cease-fire. It also gave its leaders an incentive not to exacerbate the violence, which could stall the talks.
- ELN/FARC often resorted to kidnapping, which would not show up in the killed/wounded data.
- The locations of the attack must have played a role. ELN/FARC conducted disproportionally many of its attacks outside the biggest cities of Colombia. For SL and FMLN, Lima and San Salvador, respectively, were the major targets.

# 4 Targets and Methodologies

## 4.1 Nationality of Attack Targets

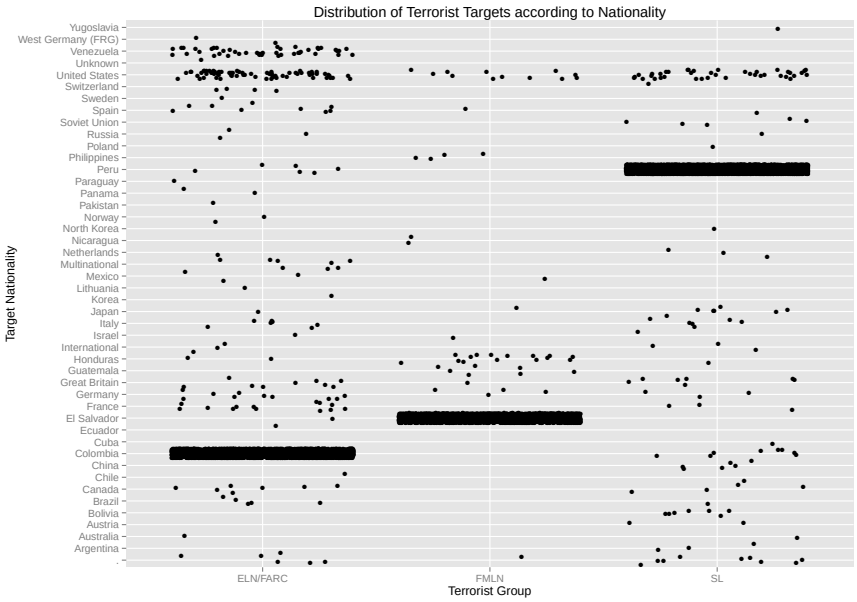


Figure 7: Scatter distribution of terrorist targets according to nationality of the targets

As we can see in figure 7, the target and the terrorist group share the same nationality. Nevertheless, foreign citizens are also targeted, though at a very low rate. Table 2 displays the nationality of targets as a share of all targets by each group. Targeted nationalities with less than ten attacks against them were discarded. United States citizens were the most frequently targeted foreign nationality by ELN/FARC. Table 2 shows that 2.13% of ELN/FARC and 0.89% of SL attacks targeted US citizens. US citizens are often targeted because of the general belief in Latin America that US government tends to support right-wing dictators in their nations. Other than US citizens, citizens of neighboring nations were also at risk of being targeted by the terrorist group caused by the spillover of the violence[8]. For example, 1.35% of ELN/FARC attacks are also targeting citizens of neighboring Venezuela and 0.45% of FMLN targets are Honduran. In addition, FMLN shows the lowest transnational terrorism since 98.51% of its terrorist activities are intranational compared to 93.11% and 97.17% for ELN/FARC and SL, respectively. Overall, the low level of transnational terrorism can be explained by their main focus being their local rightwing dictatorships[9].

## 4.2 Trend of Military Expenditure and Terrorism

Military expenditure data for Colombia, El Salvador and Peru were obtained from Stockholm International Peace Research Institute (SIPRI) and cross-analyzed with the frequency of terrorism performed by those groups[10]. However, the database from SIPRI only contains data from 1988 to 2003, hence, the comparisons were only made within that period only. In general, higher military expenditure often results with lower frequency of terrorism in the country as shown in Figure 8 and Figure 9. Colombia has highest military

[8]Crenshaw, Martha. "Why America? The Globalization of Civil War." Current History100.650 (2001): 425-32

[9]Feldmann, Andreas E., and Maiju Perala. "Reassessing the Causes of Nongovernmental Terrorism in Latin America." Latin American Politics & Society 46.2 (2004): 101-32

[10]http://www.sipri.org/research/armaments/milex

| Group | TargetCitizen | Frequency | Percent |
|---|---|---|---|
| ELN/FARC | Colombia | 3107 | 93.11 |
| ELN/FARC | France | 13 | 0.39 |
| ELN/FARC | United States | 71 | 2.13 |
| ELN/FARC | Venezuela | 45 | 1.35 |
| FMLN | El Salvador | 3301 | 98.51 |
| FMLN | Honduras | 15 | 0.45 |
| FMLN | United States | 12 | 0.36 |
| SL | Peru | 4390 | 97.17 |
| SL | United States | 40 | 0.89 |

Table 2: Top Nationality Targets by the Terrorist Groups

expenditure compared to El Salvador and Peru, which might explain its lower rate of terrorism activity compared to the other two countries. Also, Colombia's military expenditure dropped between 1996 to 1997 may be the reason for the highest terrorism rate in 1997. Then, terrorism activity dropped to lowest level in 1998 before rising back until 2002. The military expenditure also increased to counter the rising amount of terrorism at the same time. El Salvador has the lowest military expenditure of the three countries, thus, this may explains its high terrorism activity during the rebellion years. Terrorism only stops in El Salvador after 1992 after FMLN seized being a rebel group in favor for legal political struggle. Peru shows steady decline in terrorism activity as its military expenditure increased, which may result with the declining number of terrorist acts. Therefore, the two plots do show that terrorism activity and military expenditure might be inter-related.

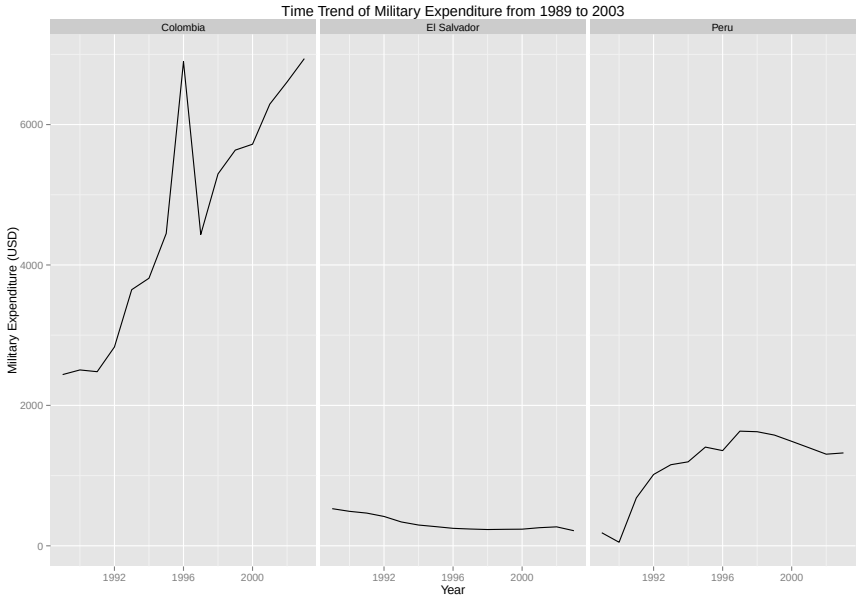


Figure 8: Military Expenditure of Colombia, El Salvador and Peru from 1989 to 2003

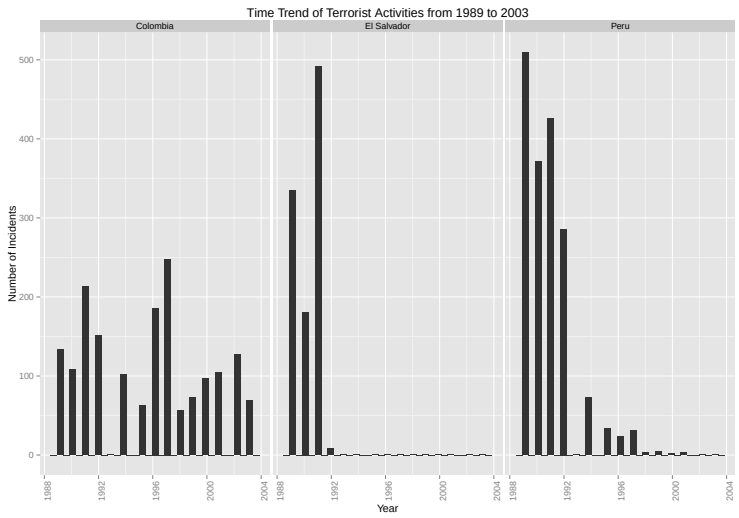


Figure 9: Number of terrorist incidents performed by ELN/FARC, FMLN, and SL from 1989 to 2003.

### 4.3 Target of Terrorist Acts

The type of targets are limited to only targets that received more than 100 terrorist attacks in order to clean up less significant data. From the observation in Figure 10, FMLN targets are mainly military and utilities while the other groups have more varieties of targets such as businesses, government, police and private citizens. This trend may also be caused by the fact that Colombia and Peru have higher military expenditure compared to El Salvador, thus, the terrorist groups have to divert their attack on targets other than military to achieve maximum effect. Drug-related industries in Colombia and Peru may also explain the reason for attacks on targets other than military such as drug traffickers and peasant communities. The choice of targets may also shown that ELN/FARC and SL had indiscriminately choosing targets in order to demoralize government supporters and discourage civilians from supporting the government. From these trend, it can be seen that FMLN had different modus operandi than the other groups since it only focused on military target while the others attacked various targets to achieve their goals.

Most of the terrorist attempts were successful with all groups recorded more than 90% success rate as indicated by Table 3. This might be due to the loose criteria of success defined by the database as success is defined as any terrorist acts that yield tangible outcome regardless of the terrorist attacks' objective. Table 3 also show that FMLN has higher rate of success compared to the other groups. Lower military expenditure in El Salvador may be the reason for higher success of this terrorist group in comparison with those in Colombia and Peru.

However, we should take the data on US targets as a percentage of all international targets and on the success rate with a grain of salt. We would expect a very high proportion of the incidents involving US citizens to be reported and recorded in the database, while for some other countries this might not be the case, which would skew the results. Moreover, we do think the success rate always represents the actual state of affairs. Suppose a military base drastically increased its level of security. It would deter some of the least prepared and worst organized groups from attempting an attack. Thus, a success rate might actually increase, but it is not a good measure of the security level.

Figure 10 indicates that all terrorist groups mostly used firearms and explosives to conduct their terrorist acts. The equipments were mostly obtained from Soviet Union and Cuba since these groups were supported

[10] Steinitz, Mark. "The Terrorism and Drug Connection in Latin America's Andean Region."Policy Papers on the Americas XIII (2002)

| Group | Success | Fail |
|---|---|---|
| ELN/FARC | 94.33 | 5.67 |
| FMLN | 99.36 | 0.64 |
| SL | 95.70 | 4.30 |

Table 3: Percentage of Success and Failure of Attacks by the Terrorist Groups

by these nations due to similarity of their political ideology. These weapons were also brought by drug trafficker in exchange, which also supplied income for these terrorist group especially FARC and SL. Hence, the support from communist nations and drug trafficker made it easy for the terrorist groups to obtain firearms and explosives.

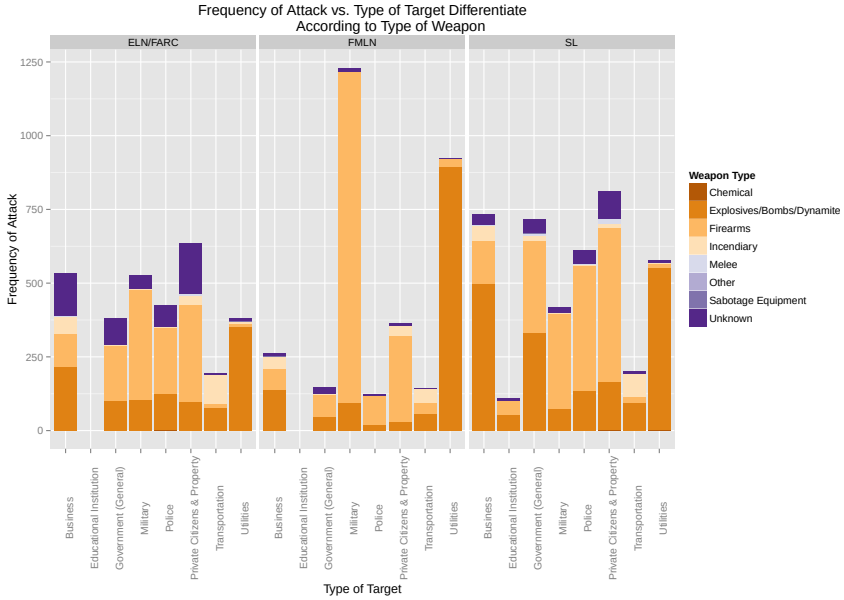


Figure 10: Number of terrorist incidents performed by ELN/FARC, FMLN, and SL on various type of targets with type of weapon used

Attack type was narrowed down to four types namely armed assault, assassination, bombing/explosion and hostage taking (kidnapping) as these type of attacks were the most frequent with occurrence of than 100 incidents. Figure 11 shows that ELN/FARC conducted all of attacks except assassination, while FMLN only conducted armed assault and bombing, and SL conducted all except kidnapping. In Colombia, kidnapping had been used as method to extort money as a source income for the terrorist groups. For that reason, businesses, government officials and private citizens were also the target of the terrorist groups in Colombia. In Peru, SL conducted assassination on police to steal their weapon. They also assassinate elected officials and civilians that were against them in order to obtain control of certain region.

Number of killed are mostly highest in military target except for SL in which private citizens are the highest casualties as shown by Figure 12. Military target was expected to be high since they are the fore enemy that fight against the terrorist groups. However, high private citizens and property casualties especially for SL group may be caused by the group's violence on peasant communities. Peasant communities were targeted as SL was preaching anti-technological agenda and banned usage of modern farming equipments. SL

[10]Steinitz, Mark. "The Terrorism and Drug Connection in Latin America's Andean Region."Policy Papers on the Americas XIII (2002)

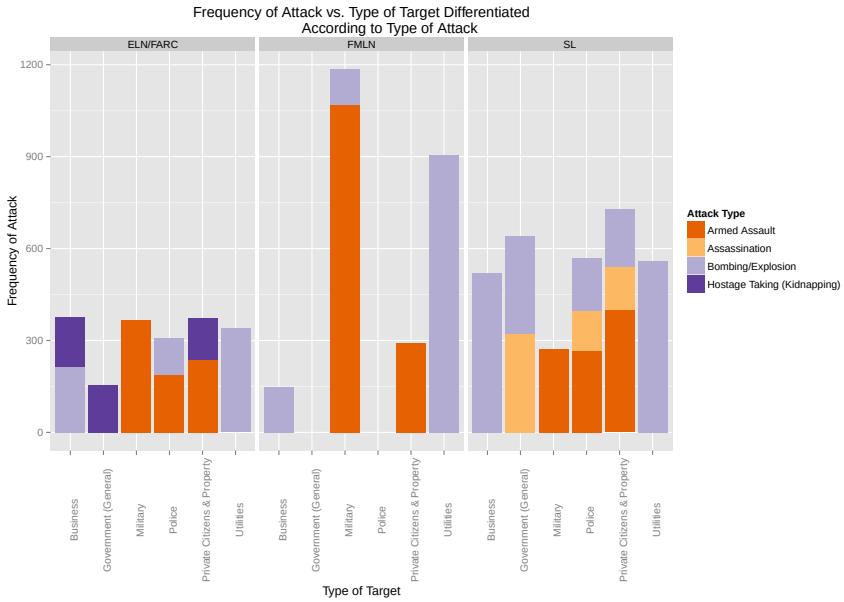


Figure 11: Number of terrorist incidents performed by ELN/FARC, FMLN, and SL on various type of targets with type of attack

also recorded high casualties of police and government official compared to other groups as they operated by assassinating police, elected officials and professional to gain control and weaponry in Huallaga region.

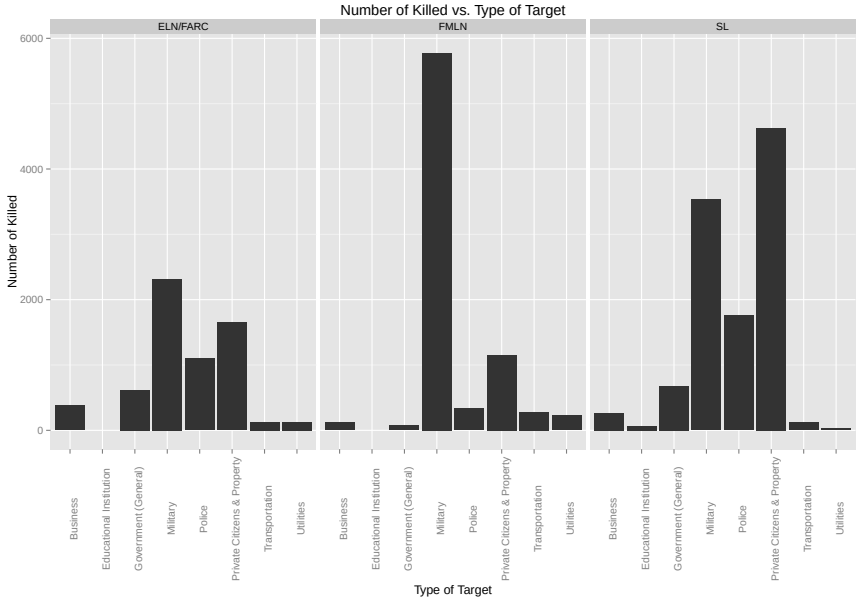


Figure 12: Number of killed on various type of targets

[10] Fitz-Simons, Daniel W. "Sendero Luminoso: Case Study in Insurgency." MARINE CORPS COMMAND AND STAFF COLL QUANTICO VA (1993)

## 5 Conclusion

Our goal was to find differences and similarities between the terrorist organizations with similar backgrounds. In section 2 we argued that the two largest Colombian groups, ELN and FARC, instead of competing with each other like political parties might, chose to cooperate. There was a pattern to the timing of the groups' attacks-when one increased the frequency of its attacks, the other decreased its, and vice versa. The two groups also complemented each other geographically; ELN had a stronger presence in urban areas, while FARC was more active in the mid-size cities and rural areas.

In section 3, we showed that there are differences in the patterns of violence between the three groups. As it turns out, each group has its own preference as to the weapons they use and the type of cities (large vs. mid-size), on which they chose to focus their activity. The Global Terrorism Database cannot account for the roots of these differences; however, we have argued that they are at least partially results of tactics and circumstances.

In section 4, we showed that the terrorist groups' targets are rarely international. For each group over 93% of targets are intranational. United States is the second most targeted nationality. However, we cannot be sure if it is the real state of affairs or if US targets are overrepresented in the dataset. In section 4.2 we presented some evidence that there might be negative relationship between national spending on anti-terrorism and the level of terrorist activity in each country. Finally, we show that explosives and firearms constitute the majority of weapons used, which supports our inference in section 3 that explosives are used primarily to destroy buildings and infrastructure.

There are several ways differences and similarities between terrorist groups could be further investigated. One possible avenue is to analyze the differences between the successful and unsuccessful attacks and see if there are some systematic differences between the two (for instance, unsuccessful attempts could have been aimed at well-guarded military objects). Moreover, if the GTD included coordinates for the attacks in South America, we would be able to conduct a more in-depth analysis of the target's locations.

## A Code

```
#######################
##### Stat 405    #####
##### Project 2   #####
##### Final Code  #####
#######################
library(ggplot2)
library(plyr)
library(maps)
library(stringr)
library(lubridate)
library(reshape2)
library(xtable)

## Load our dataset
gtd <- read.csv("gtd.csv", stringsAsFactors = F)

## We are looking at 4 terrorist groups in this report
## Subset accordingly
gtd.new <- subset(gtd, gname == "Shining Path (SL)"  |
                  gname == "Farabundo Marti National Liberation Front (FMLN)" |
                  gname == "Revolutionary Armed Forces of Colombia (FARC)" |
                  gname == "National Liberation Army of Colombia (ELN)")


###
## Colombian Revolutionary Organizations
###

## Create a subset of only Colombian groups
gtd.colombia <- subset(gtd.new,
                gname == "Revolutionary Armed Forces of Colombia (FARC)" |
                gname == "National Liberation Army of Colombia (ELN)")

## Create date column in dataset based on eventid vector
gtd.colombia <- mutate(gtd.colombia, date = substring(eventid, 1, 8))
gtd.colombia <- gtd.colombia[-which(gtd.colombia$iday == 0), ]
gtd.colombia$date <- ymd(gtd.colombia$date)

# See if their sinusoidal activity waves align
h <- qplot(date, ..density.., geom = "freqpoly", color = gname, binwidth = 2e6,
           data = subset(gtd.colombia, iyear >= 1987 & iyear <= 1992))

# Towards the end of 1990, the army, with no advance warning and
# while negotiations were still ongoing with the group, attacked a
# compound known as Casa Verde, which housed the National Secretariat of
# the FARC-EP. The Colombian government argued that the attack was caused
```

```
# by the FARC-EP's lack of commitment to the process, since the organization
# was continuing its criminal activities. August 10th founder dies.
# 1989 Fall of Communism in Eastern Europe
# July 4th 1991, New constitution in Colombia, lots of terrorism

# Creat labels
label1 <- annotate("text", x = ymd("1989-05-05"), y = 8e-08,
                   label = "1", size = 8, color = "red")

label2 <- annotate("text", x = ymd("1990-08-10"), y = 8e-08,
                    label = "2", size = 8, color = "red")

label3 <- annotate("text",  x = ymd("1991-07-04"), y = 8e-08,
                    label = "3", size = 8, color = "red")

dates <- c(ymd("1989-05-05"), ymd("1990-08-10"), ymd("1991-07-04"))
dates <- as.numeric(dates)

timeline <- geom_vline(xintercept = dates,
                       alpha = 0.5, size = 0.75)

# Make plot with labels
h <- h + timeline + label1 + label2 + label3
h <- h + theme(legend.position = "bottom")
h <- h + labs(color = "Group") + xlab("Date")
h <- h + ggtitle("Frequency of Attacks by Group and Date")
h

ggsave("colombia-compare.pdf")


## Lets compare across cities
## Create city counts
counts <- count(gtd.colombia, "city")
counts <- counts[order(counts$freq, decreasing = TRUE), ]

## FARC
## Consider attacks on city / total attacks
farc.counts <- count(subset(gtd.colombia,
               gname == "Revolutionary Armed Forces of Colombia (FARC)"),
               "city")

farc.counts$freq <- farc.counts$freq / length(which(gtd.colombia$gname ==
                    "Revolutionary Armed Forces of Colombia (FARC)"))

## Take top 10
farc.counts <- farc.counts[order(farc.counts$freq, decreasing = T), ]
farc.counts <- farc.counts[1:10, ]
```

```
## ELN
## Consider attacks on city / total attacks
eln.counts <- count(subset(gtd.colombia,
               gname == "National Liberation Army of Colombia (ELN)"),
               "city")

eln.counts$freq <- eln.counts$freq / length(which(gtd.colombia$gname ==
                    "National Liberation Army of Colombia (ELN)"))

## Take top 10
eln.counts <- eln.counts[order(eln.counts$freq, decreasing = T), ]
eln.counts <- eln.counts[1:10, ]

farc.counts$group = "FARC"
eln.counts$group = "ELN"

## Turn the two separate counts into one dataframe
combined <- rbind(farc.counts, eln.counts)

## Plot city names
qplot(reorder(city, freq), freq, data = combined, fill = group,
      geom = "histogram")

## Fix duplicate cities
combined$city[which(combined$city == "Cali" &
                      combined$group == "ELN")] <- "Cali "

combined$city[which(combined$city == "Unknown" &
                      combined$group == "ELN")] <- "Unknown "

combined$city[which(combined$city == "Bogota" &
                      combined$group == "ELN")] <- "Bogota "

combined$city[which(combined$city == "Medellin" &
                      combined$group == "ELN")] <-"Medellin "

## Try plot again
qplot(reorder(city, freq), freq, data = combined, fill = group,
      geom = "histogram") +
      theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
      xlab("City") + ylab("% of All Recorded Attacks") +
      ggtitle("Most Active Terror Hubs in Colombia")

ggsave("colombia-cities.pdf")

## Both pretty active in Bogota, Kind of Medellin although ELN out of prop
```

```
## Lets see where these attacks took place visually
## Load Colombian City data
colcities <- read.csv("colcities.csv", header = T)

## Merge our combined frequency data frame and the new location data frame
merged.col <- merge(colcities, combined, by = "city")

## Initialize world data
## Later we subset to only extract Colombia
world <- map_data("world")
colombia <- subset(world, region == "Colombia")

## Let's try drawing just Colombia to make sure it works
qplot(long, lat, data = colombia, group = group, geom = "path") + coord_map()

## Add city names, frequencies, and groups
## Most of the code is cleanup
## Remove axis ticks, labels, etc.
c <- ggplot() + geom_path(aes(x = long, y = lat, group = group),
                          data = colombia)

c <- c + geom_point(aes(x = longitude, y = latitude, size = freq,
                        color = group, alpha = freq), data = merged.col)

c <- c + scale_size_continuous(range = c(3, 10))

c <- c + scale_alpha_continuous(range = c(0.6, .7))

c <- c + geom_text(aes(label = city, x = longitude,
                       y = latitude, size = .02), data = merged.col,
                   position = NULL, vjust = 1)

c <- c + theme_bw() + scale_x_continuous(breaks = NULL)

c <- c + scale_y_continuous(breaks = NULL) + xlab(NULL) + ylab(NULL)

c <- c + theme(panel.grid.minor=element_blank(),
               panel.grid.major=element_blank())

c <- c + theme(axis.text.x = element_blank(), axis.text.y = element_blank())

c <- c + theme(legend.position = "bottom")

c <- c + xlim(-80, -65) + ylim(-5, 13)

c <- c + ggtitle("Most Frequent Terrorist Attacks for ELN and FARC")
```

```
c

ggsave("col-map.pdf", width = 8, height = 8)



###
##      Violence
###

#
# I - Basic Subsets
#


## Re-label groups and combine the two Colombian ones
gtd.new$gname <-c("National Liberation Army of Colombia (ELN)" = "ELN/FARC",
               "Revolutionary Armed Forces of Colombia (FARC)" = "ELN/FARC",
               "Farabundo Marti National Liberation Front (FMLN)" =
                 "FMLN", "Shining Path (SL)" = "SL")[gtd.new$gname]

## Get rid of NAs for nkill, nwound, weaptype1
gtd3 <- gtd.new[!is.na(gtd.new$nkill), ]
gtd3 <- gtd3[!is.na(gtd3$nwound), ]
gtd3 <- gtd3[!is.na(gtd3$weaptype1), ]

## Create subsets for each of the groups (used below for
## getting ratios for tables)
gtd_eln <- subset(gtd3, gname == "ELN/FARC")
gtd_fmln <- subset(gtd3, gname == "FMLN")
gtd_sl <- subset(gtd3, gname == "SL")

#
# II - Ratios for tables
#

# table(gtd3$gname)
# ELN/FARC     FMLN       SL
# 3079         2539     3974

## Proportion of nkills to the # of events
sum(gtd_eln$nkill)/3079
sum(gtd_fmln$nkill)/2539
sum(gtd_sl$nkill)/3974

## Proportion of nwounds to the # of events
sum(gtd_eln$nwound)/3079
sum(gtd_fmln$nwound)/2539
```

```
sum(gtd_sl$nwound)/3974

## Proportion of nkill to years of activity
sum(gtd_eln$nkill)/(2011-1972)
sum(gtd_fmln$nkill)/(1994-1978)
sum(gtd_sl$nkill)/(2009-1980)

## proportion of nwound to years of activity
sum(gtd_eln$nwound)/(2011-1972)
sum(gtd_fmln$nwound)/(1994-1978)
sum(gtd_sl$nwound)/(2009-1980)

#
# III - Tables
#

## Table 1
## Killed/wounded per event
x <- c("ELN/FARC", "FMLN", "SL")
y <- c(1.89607, 2.911382, 2.772774)
z <- c(1.45112, 1595904, 3.265727)
df <- data.frame(y,z, row.names = x)
xtable(df)

# xtable(df) creates a code which I just pasted to LaTeX to make the table

## Table 2
## Killed/wounder per year of activity
a <- c(114.5641, 253.25, 447.5172)
b <- c(149.6923, 462, 379.9655)
df2 <- data.frame(b, a, row.names = x)
xtable(df2)

#
# IV - Plots
#

## Look at number killed and wounder per year
gtd3 <- mutate(gtd3, total = nkill + nwound)

qplot(iyear, total, data = gtd3, color = gname, ylim = c(0,140),
      xlim = c(1975, 2011), xlab = "Year", ylab = "Killed and Wounded",
      alpha = I(.35)) +
      facet_wrap(~gname)

ggsave("plot12.png")

###
```

```
### Average wounded per weapon type
## Remove NA values for wounded
gtd.nkill.na <- gtd.new[-which(is.na(gtd.new$nwound)), ]

## For each gang and weapon, count the total number of wounded
test <- ddply(gtd.nkill.na, c("gname", "weaptype1_txt"), summarise,
              count = sum(nwound))

## Create our vector of weapon types
weap_types <- unique(test$weaptype1_txt)

## Allocate memory for counts of each weapon
weap_counts <- c()

## The gangs we are looking at
gangs <- unique(gtd.nkill.na$gname)

## Fill up how many times each weapon was used
for (i in 1:length(weap_types)) {
  weap_counts[i] <- length(which(gtd.nkill.na$weaptype1_txt == weap_types[i]))
}

## Align weapon types with their respective counts
weap_counts <- as.data.frame(cbind(weap_types, weap_counts),
                             stringsAsFactors = F)

## Merge our wounded counts with weapon counts
## Take the average amount wounded per weapon per gang
test2 <- merge(test, weap_counts, by.x = "weaptype1_txt", by.y = "weap_types")
test2$weap_counts <- as.numeric(test2$weap_counts)
test2$avg <- test2$count / test2$weap_counts

## Clean weaptype1_txt vector
test2$weaptype1_txt <- c("Explosives/Bombs/Dynamite" = "Explosives",
                         "Sabotage Equipment" = "Sabotage Eq",
                         "Chemical" = "Chemical",
                         "Firearms" = "Firearms",
                         "Incendiary" = "Incendiary",
                         "Melee" = "Melee",
                         "Other" = "Other",
                         "Unknown" = "Unknown")[test2$weaptype1_txt]

## Plot avg wounds per weapon per gang
qplot(reorder(weaptype1_txt, avg), avg, stat = "identity",
      data = test2, geom = "histogram", fill = gname,
      ylab = "Wounded per event", xlab = "Weapon Type",
      main = "The Average Number of Wounded When\n Each Weapon is Used") +
      theme(legend.position = "bottom") +
```

```
      theme(axis.text.x = element_text(angle = 90, hjust = 1))

ggsave("plot2.png", width = 6, height = 6)


## We repeat the above process but now we are looking at the average number
## killed when each weapon is used for each gang
gtd.nkill.na <- gtd.new[-which(is.na(gtd.new$nkill)), ]

## Count number killed for each weapon type for each gang
test <- ddply(gtd.nkill.na, c("gname", "weaptype1_txt"), summarise,
              count = sum(nkill))

## Merge our killed counts with weapon counts
## Take the average amount killed per weapon per gang
test2 <- merge(test, weap_counts, by.x = "weaptype1_txt", by.y = "weap_types")
test2$weap_counts <- as.numeric(test2$weap_counts)
test2$avg <- test2$count / test2$weap_counts

## Clean weaptype1_txt vector
test2$weaptype1_txt <- c("Explosives/Bombs/Dynamite" = "Explosives",
                         "Sabotage Equipment" = "Sabotage Eq",
                         "Chemical" = "Chemical",
                         "Firearms" = "Firearms",
                         "Incendiary" = "Incendiary",
                         "Melee" = "Melee",
                         "Other" = "Other",
                         "Unknown" = "Unknown")[test2$weaptype1_txt]

## Plot avg amount of kills per weapon per gang
qplot(reorder(weaptype1_txt, avg), avg, stat = "identity",
      data = test2, geom = "histogram", fill = gname,
      ylab = "Kills per event", xlab = "Weapon Type",
      main = "The Average Number of Casualties When\n Each Weapon is Used") +
      theme(legend.position = "bottom") +
      theme(axis.text.x = element_text(angle = 90, hjust = 1))

ggsave("plot3.png", width = 6, height = 6)


## Look at deadliest cities
## Count occurence of each city for each gang
## We only care about cities that aren't unkown and have more than 50 records
play <- count(gtd3, vars = c("city", "gname"))
play2 <- play[play$freq > 50, ]
play3 <- play2[!play2$city == "Unknown", ]

qplot(reorder(city, freq), freq, data = play3, geom = "histogram",
```

```
      fill = gname, xlab = "City", ylab = "Number of attacks",
      main = "In Which Cities are Attacks\n Most Frequent?") +
      theme(legend.position = "bottom") +
      theme(axis.text.x = element_text(angle = 90, hjust = 1))

ggsave("plot4.png", width = 6, height = 6)


## Consider cities in which attacks are deadliest
gtd_city <- subset(gtd.new, nkill > 75)
gtd_city$city <- c("Cerro Pea Blanca" = "Cerro",
                   "Chaparrastique Volcano" = "Chaparrastique",
                   "Chichontepec Volcano" = "Chichontepec",
                   "Santa Rosa (Ayacucho)" = "Santa Rosa",
                   "Bojaya" = "Bojaya",
                   "Cinquera" = "Cinquera",
                   "Corinto" = "Corinto",
                   "Las Vueltas" = "Las Vueltas",
                   "Unknown" = "Unknown")[gtd_city$city]

## Remove NA and Unknown cities
gtd_city2 <- gtd_city[!is.na(gtd_city$city), ]
gtd_city3 <- gtd_city2[!gtd_city2$city == "Unknown", ]

## Plot deadliest cities
qplot(reorder(city, nkill), nkill, data = gtd_city3, geom = "histogram",
      fill = gname, stat = "identity", ylab = "Number of killed",
      xlab = "City",
      main = "Which Cities Suffered from\n the Deadliest Attacks?") +
      theme(legend.position = "bottom") +
      theme(axis.text.x = element_text(angle = 90, hjust = 1))

ggsave("plot5.png", width = 6, height = 6)




###
## Targets and Methodologies
###

## Read in military expenditures data
military <- read.csv("military.csv", stringsAsFactors = F)

## Create function to match countries with terrorist groups
authority <- function(country) {

  gname <-
```

```
    c("El Salvador" = "FMLN", "Colombia" = "ELN/FARC", "Peru" = "SL")[country]

  gname

}

## Calculate percentage of nationality of each target
## Count number of times each gang appears using plyr
countincident <- count(gtd.new, vars = "gname", wt_var = NULL)
names(countincident) <- c("gname", "incident")

## Count nationalities of targets for each gang
countnation <- count(gtd.new, vars = c("gname", "natlty1_txt"), wt_var = NULL)

## Remove very low counts
countforeign <- subset(countnation, freq > 10)
countforeign2 <- join(countincident, countforeign, match = "all")
countforeign3 <- mutate(countforeign2, percent = (freq*100)/incident)

## Create table for percentage of targets according to nationalities
tableforeign <- countforeign3
names(tableforeign) <- c("Group", "TotalIncident", "TargetCitizen",
                         "Frequency", "Percent")

xtable(tableforeign, align = "|cc|cccc|")

## Create scatter plot of target nationality by group
qplot(gname, natlty1_txt, data = gtd.new, geom = "jitter") +
      ylab("Target Nationality") + xlab("Terrorist Group") +
      ggtitle("Distribution of Terrorist Targets according to Nationality")

ggsave("National_gname.pdf", width = 11.69, height = 8.27)

## Create bar plot for percentage of top targeted nationalities
## by group
qplot(natlty1_txt, percent, data = countforeign3, geom = "bar") +
      facet_grid(.~gname) + opts(axis.text.x = theme_text(angle=90)) +
      ylab("Percent of Incidents") + xlab("Target Nationality") +
      ggtitle("Target Nationality Distribution of ELN/FARC, FMLN, and SL")

ggsave(filename = "Percent_national.pdf", width = 11.69, height = 8.27)

## Create a subset for all years greater than or equal to 1989
## in order to be consistent with our military expenditure outside data
year89 <- subset(gtd.new, iyear >= 1989)

## Melt military data and add terrorist group name
m.military <- melt(military, id = "Year")
```

```
m.military$variable <- c("El.Salvador" = "El Salvador",
                         "Colombia" = "Colombia",
                         "Peru" = "Peru")[m.military$variable]

## Clean column names
names(m.military) <- c("iyear", "country", "Military_Expenditure")

## Clean country column
gname <- authority(m.military$country)

## Add the gname column to our melted military set
m.military <- cbind(m.military, gname)

## Subset our data to variables we are interested in
year89reduced <- year89[, c("iyear", "country_txt", "attacktype1_txt",
                            "targtype1_txt", "natlty1_txt", "gname",
                            "weaptype1_txt")]

## Combine military expenditure with subsetted GTD
combinedf <- join(year89reduced, m.military, type = "right", match = "all")

## Glance at military expenditures over time
qplot(iyear, Military_Expenditure, data = combinedf, geom = "line") +
      facet_grid(.~country) + ylab("Military Expenditure (USD)") +
      xlab("Year") +
      ggtitle("Time Trend of Military Expenditure from 1989 to 2003")

ggsave(filename = "Military_year.pdf", width = 11.69, height = 8.27)

## Look at terrorism over time
qplot(iyear, data = combinedf ) + facet_grid(.~country) +
      opts(axis.text.x = theme_text(angle=90)) + ylab("Number of Incidents") +
      xlab("Year") +
      ggtitle("Time Trend of Terrorist Activities from 1989 to 2003")

ggsave(filename = "Incident_year.pdf", width = 11.69, height = 8.27)

## Create factors from success and propextent columns
levels <- c(1,0)
labels <- c("Success", "Fail")
gtd.new$success <- factor(gtd.new$success, levels = levels,
                          labels = labels)

gtd.new$propextent[is.na(gtd.new$propextent)] <- 4
levels <- c(1, 2, 3, 4)
labels <- c("Catastrophic", "Major", "Minor", "Unknown")
gtd.new$propextent <- factor(gtd.new$propextent, levels = levels,
```

```
                              labels = labels)

## Only care about targets that have been hit over 100 times
counttarget <- count(gtd.new, vars = c("gname", "targtype1_txt"),
                     wt_var = NULL)

counttarget2 <- subset(counttarget, freq > 100)

## Target type by frequency of incident
qplot(targtype1_txt, freq, data = counttarget2, geom = "bar") +
      facet_grid(.~gname) + opts(axis.text.x = theme_text(angle=90)) +
      ylab("Frequency of Attack") + xlab("Type of Target") +
      ggtitle("Frequency of Attack vs. Type of Target")

ggsave(filename = "Frequency of Attack1.pdf", width = 11.69, height = 8.27)

## Combine subsetted value counttarget2 so it contains
## variable of main database
target <- join(gtd.new, counttarget2, type = "right",
               by = c("gname","targtype1_txt"), match = "all")

## Target type by success
qplot(targtype1_txt, data = target, fill = success) +
      scale_fill_grey(name = "Success Level", start = 0.7, end = 0.3) +
      facet_grid(.~gname) + opts(axis.text.x = theme_text(angle=90)) +
      ylab("Frequency of Attack") + xlab("Type of Target") +
      ggtitle("Frequency of Attack vs. Type of Target Differentiated
              According to Success Level")

ggsave(filename = "Freq_targetsuccess.pdf", width = 11.69, height = 8.27)

## Look at percent success tables
## Count target based by gang and success
tablesuccess <- count(target, vars = c("gname", "success"), wt_var = NULL)

## Count target based on gang
totalincident <- count(target, vars = "gname", wt_var = NULL)

## Join the two
tablesuccess2 <- join(tablesuccess, totalincident, type = "right",
                      by = "gname", match = "all")

## Clean column names
names(tablesuccess2) <- c("Group", "Success", "NumberofIncident", "Total")

## Add success rate column
tablesuccess2 <- mutate(tablesuccess2, Percent = (NumberofIncident*100)/Total)
```

```
xtable(tablesuccess2[, c("Group", "Success", "Percent")], align = "|c|c|cc|")

## Target type by weapon type
qplot(targtype1_txt, data = target, fill = weaptype1_txt) +
      scale_fill_brewer(name = "Weapon Type", palette = "PuOr") +
      facet_grid(. ~ gname) + opts(axis.text.x = theme_text(angle = 90)) +
      ylab("Frequency of Attack") + xlab("Type of Target") +
      ggtitle("Frequency of Attack vs. Type of Target Differentiate
              According to Type of Weapon")

ggsave(filename = "Freq_targetweapon.pdf", width = 11.69, height = 8.27)

## Focus on attack types with more than 100 incidents
countaatack <- count(gtd.new, vars = c("gname", "targtype1_txt",
                                       "attacktype1_txt"), wt_var = NULL)

targetattack <- subset(countaatack, freq > 100)

## Target type by attack type
qplot(targtype1_txt, freq, data = targetattack, geom = "bar",
      fill = attacktype1_txt) + facet_grid(. ~ gname) +
      scale_fill_brewer(name = "Attack Type", palette = "PuOr") +
      opts(axis.text.x = theme_text(angle = 90)) +
      ylab("Frequency of Attack") + xlab("Type of Target") +
      ggtitle("Frequency of Attack vs. Type of Target Differentiated
              According to Type of Attack")

ggsave(filename = "Freq_targetattack.pdf", width = 11.69, height = 8.27)

## Total number of kills for each target type
target2 <- ddply(target, c("gname", "targtype1_txt"), summarise,
                 sumtarg = sum(nkill, na.rm = T))

## Number of kills for each target type
qplot(targtype1_txt, sumtarg, data = target2, geom = "bar") +
      facet_grid(. ~ gname) + opts(axis.text.x = theme_text(angle = 90)) +
      ylab("Number of Killed") + xlab("Type of Target") +
      ggtitle("Number of Killed vs. Type of Target")

ggsave(filename = "Nkill_target.pdf", width = 11.69, height = 8.27)

############################
######### Fin. ############
############################
```