Muslim Victims of Terrorism Violence in Southern Thailand

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Abstract

We investigated statistical models for describing the incidence rate of injuries to civilian resident victims of violence from terrorism in Pattani, Yala and Narathiwat provinces and four eastern districts of Songkhla province. For six years, there were 4,143 Muslim residents and 3,544 other (mainly Buddhist) residents of the target area have been recorded as victims by the Deep South Coordination Centre (DSCC). The overall incidence rates per 100,000 residents are 48 for Muslims and 121 for non-Muslims. We focused on the Muslim population and fitted negative binomial and log-normal models to incidence rates classified by gender, age group, region and year, with comparing relative risk by these factors, after adjusting for other factors to remove confounding. The models gave different results and showed that while specific regions were at higher risk at different times and these patterns could not be easily predicted, risks in different demographic groups remained relatively constant.

Keywords: terrorism violence, relative risks, statistical models, negative binomial model, log-normal model, Muslim victims, Southern Thailand.

1. Introduction

A dramatic raid on an army base in Narathiwat on January 4, 2004 clearly signaled a renewed outbreak of terrorism violence in southern Thailand. Subsequently, the martial law has been declared in the three southern provinces, Pattani, Yala and Songkhla, on January 5, 2004 (Cline, 2007). Two further flashpoints were followed on April 28, 2004 when insurgents attacked 15 security posts with the army retaliating which culminated in a bloody siege of the historic Kru Se mosque in Pattani and killing over 100 people and a mass demonstration at Tak Bai, Narathiwat on October 25, 2004 where 78 unarmed protestors died, mainly from suffocation, after being locked up and spending more than five hours lying in the back of army trucks. These victims are mainly Muslim men signified a sharp deterioration in the security situation among Muslim residents in Pattani, Yala and Narathiwat provinces and four eastern districts of Songkhla province (Ward & Hackett, 2004; McCargo, 2009).

Several studies have been written about the facts surrounding and alleged causes of the situation that has developed in the seven years since the violence escalated.

A recent report by the International Crisis Group (2010) gives a detailed history of the relevant background and events. Nakata (2010) recently devoted a complete issue to this subject. These papers reveal a wide range of scholarly views, but little if any serious analysis of data. To our knowledge, there are only three substantial scholarly analyses of the data that are publicly available. The first is a publication by Marohabout et al. (2009) that fitted a statistical model to events classified by location and month (in 2004 and 2005), using data files provided in police reports in the terrorism target area (defined as the three provinces Pattani, Yala and Narathiwat and the four easternmost districts of Songkhla province). The second is a conference paper presented by Khongmark and Kuning (2010) that modeled injury incidence rates for non-Muslims in the target area for years 2004-2009 inclusive, using data recorded in the database of the Deep South Coordination Center (DSCC). The third is an unpublished report by Jitpiromsri (2010) that provides statistical graphs and summaries of the 9,446 terrorism incidents resulting in approximately 4,100 deaths and 6,500 non-fatal injuries, again using the Deep South Watch database for the 73 months from January 2004 to January 2010 inclusive.

It should be noted that these articles all defined events as occurrences on both sides of the conflict, that is, the victims included both civilians and non-civilians (defined as army and police personnel). Since such non-civilians could be regarded not just as victims but also as protagonists, we focus in this paper on Muslim civilian victims. Our objective is to provide a detailed analysis of these victim incidence rates, using appropriate statistical models that take into account the gender, age-group, location and year of the event.

2. Materials and methods

2.1 Data and variables

We considered incidence rates per 100,000 population for Muslim resident civilian victims of terrorism events classified by gender, age group (<25, 25-44 and 45 or more), district of residence and year (six years from 2004 to 2009 inclusive). The data provided by the Deep South Coordination Centre (DSCC) database, Faculty of Science and Technology, Prince of Songkla University, Pattani Campus, Thailand. The population denominators were obtained from the 2000 population and housing census of Thailand, National Statistical Office. We restricted the study to Muslim victims because previous studies (in particular the 2010 report by the International Crisis Group and the 2010 conference paper by Khongmark) suggest that their patterns of violence by location and period are different from those of non-Muslim victims. The 37 districts were aggregated districts with Muslim population less than 30,000 into 23 larger regions as listed in Table 1.

2.2 Statistical methods

Linear regression (see, for example, Cook & Weisberg, 1999) is a statistical method widely used to model the association between a continuous outcome and a set of fixed determinants. The model expresses the outcome variable as an additive function of the determinants. For example, if there are two categorical determinants with levels indexed by subscripts *i* and *j*, the model takes the form

$$Y_{ij} = \mu + \alpha_i + \beta_j . \qquad (1)$$

In this case the number of parameters is $r + c - 1$ where r and c are the number of levels of the factors α and β, respectively, thus requiring two constraints, taken as $\Sigma\alpha_i = 0$ and $\Sigma\beta_j = 0$ so that μ encapsulates the average of Y. We also assume that the errors are independent and normally distributed with mean 0 and constant standard deviation. The model may be fitted to the observations y_{ij} by least squares, giving estimates and confidence intervals for the parameters. Equation (1) generalizes straightforwardly to any specified number of categorical determinants.

This method also applies to data that need to be transformed to satisfy the normality assumption, by first applying the method to the transformed data and then rescaling the result to ensure that the overall means of the untransformed data are the same before and after adjustment. It also extends straightforwardly to any number of covariate factors.

The Poisson generalized linear model is widely used for modeling event counts in incidence rates (see, for example, Crawley, 2005). For two additive factors as in the linear model given by equation (1), if P_{ij} is the population denominator, the expected value of the cell count N_{ij} is expressed as

$$E\left[N_{ij}\right] = P_{ij} \exp(\mu + \alpha_i + \beta_j) \qquad (2)$$

However, the Poisson model often does not fit incidence data in practice because it assumes that the variance is equal to the mean, and in many situations the variance is substantially greater than the mean (see, for example, Jansakul & Hinde, 2004; Kaewsompak et al., 2005; Paul & Saha, 2007; Kongchouy & Sampantarak, 2004). The standard negative binomial GLM is a generalization of the Poisson model with the same mean λ, but the variance is $\lambda(1+\lambda/\theta)$ where $\theta > 0$ (see, for example, Chapter 7 of Venables & Ripley, 2002). This over-dispersion is often the result of clustering (see, for example, Demidenko, 2007).

By analogy with the method used for means based on the linear regression model, we define the adjusted incidence rate for level j of factor β as $\exp\left(\hat{\beta}_j + c\right)$, where the constant c is chosen to ensure that the total number of adverse events based on the fitted model matches the number observed, that is,

$$\sum n_{ij} = \sum P_{ij} \exp\left(\hat{\beta}_j + c\right). \tag{3}$$

We used R software (R Development Core Team, 2011) to produce all statistical results and graphs.

2.3 Analysis strategy

To remove skewness in the linear model we transformed the incidence rates by taking their logarithms, after replacing zero counts by 0.5 to ensure finiteness.

We fitted models with two additive factors as determinants, one comprising the combination of gender and age-group, and the other comprising the combination of region and calendar year. This model differs from that used by Khongmark & Kuning (2010) who fitted an additive model comprising age-group, year, and the gender-region combination as three factors, for statistical reasons aimed at reducing the standard errors of the estimated parameters. However, we restricted to combining gender and age-group as a single demographic factor and define a single further factor combining region and year. This model was chosen because it is arguably more appropriate for studying patterns of conflict where highly mobile attackers can choose the time and place of their attack, and thus these times and place are largely unpredictable, rather than following the predictable patterns inherent in additive models.

Even though they are valid and often preferred models, the Poisson and negative binomial models also have problems with zero counts, failing to converge in situations where no events occur for a level of a factor (in contrast to linear models). This problem was circumvented by making a minimal change in the data by shifting a single non-zero count from one level to a neighbouring level, thus keeping the total number of events constant.

3. Results

During 2004 to 2010, the data covers 5,169 terrorist acts with civilian were the target, and the overall incidence rates per 100,000 residents are 48 for Muslims. There were no Muslim victims in the Chana/Thepa region in 2005, and as a result the Poisson and negative binomial models failed to converge, but convergence was achieved when the year of occurrence was changed to 2005 for one of the 4 male victims aged 25-44 who were injured in 2006. Residuals plots for the Poisson, negative binomial with dispersion parameter $\theta = 10$, and log-transformed normal models are shown in Figure 1. In each case the high outlier corresponds to male residents aged 25-44 in Tak Bai in 2004. The value $\theta = 10$ for the negative binomial dispersion parameter was chosen because after removing this outlier the deviance dropped to a value for which the chi-squared test was statistically significant, indicating a plausible fit of this model.

In Figure 2 incidence rates for each factor after adjusting for the other factor are plotted for the negative binomial model, together with corresponding adjusted incidence rates for the log-normal model. Estimates in gender-age groups are more accurate (shorter confidence intervals) because each has a larger sample size (n=90). Region-year risk estimates (n=6) are much less accurate. The regions have different trend patterns. Some rose steadily apart from a dip in 2008 (Pattani City, Batong, Bacho, Rueso and SungaiPadi/Cho-airong), whereas others rose and fell (Chana, Yala City, Raman, Yaha, BanangSta, Narathiwat City, and SungaiKolok), and rural districts of Pattani rose up to the overall incidence rate and two (SabaYoi, Batong, Tak Bai and Sukirin/Waeng) fell and rose and fell again.

In Figure 3 the results from the two models are compared with respect to estimated incidence rates and widths of confidence intervals. Estimated incidence rates (left panel) give an outlier from Tak Bai in 2004, whereas confidence interval widths (right panel) cover the outliers from Tak Bai in 2004 and SungaiKolok in 2009.

4. Conclusion and discussion

Terror-related injuries and deaths occurred in many countries such as Iraq, Afghanistan, Pakistan, India and Sri Lanka with emergence to southern Thailand. This paper investigates statistical models for describing the incidence rate of injuries to Muslims victims of violence from terrorism in Deep South (Pattani, Yala and Narathiwat) and four eastern districts of Songkhla province. The generalized linear models (GLMs) were fitted to the injury incidence rates from the terrorism violence to Muslim victims in the southern Thailand region for 6 years (2004-2009). The negative binomial and transformed linear models fit equally well in overall. However, the log-normal model gives higher estimated incidence rates when incidence rates are low. Also, the log-normal gives higher standard errors when incidence rates are high. Both models fail to handle zero counts. Estimates of adjusted incidence rates in both models need to be sealed to ensure that the overall mean incidence rate is the same before and after adjustment for covariates.

The annual risk of becoming a victim for Muslims (48 per 100,000) is less than half that for non-Muslims (121 per 100,000). The majority of victims were non-Muslim, but the percentage of Muslim deaths was higher than non-Muslim (Jitpiromsri, 2010). Muslims were targeted more by gunshot than others since those who died were more likely to be shot, while victims of bombings more likely to be non-Muslim (Chirtkiatsakul, 2011). Male has higher risk than female, particularly with male at ages 25 or more, consistent with studies of Peleg et al. (2003; 2004) and Sheffy et al. (2006). There were high risks attack occurred in the rural area than the city except for Yala City had the highest incidence rates. The risk with respect to region and year, in 2007 had the highest incidence rates in many region of each province such as Songkhla province in SabaYoi/NaTawi, Yala province in Yala City, Raman, Yaha and BannangSata, Narathiwat province in Rueso, Rangae and Sisakon. Except for Tak Bai, which had the greatest number from what happened there in October 2004, which sparked the ensuing violence, but after 2004 this region had relatively low annual incidence rates.

However, the ongoing insurgent has continued to escalate (Melvin, 2007; Wikipedia, 2011) with almost daily bombings, drive by shooting, arson and beheadings. The victims of insurgents include both Muslim (local) and non-Muslim (Buddhist), which effects on individuals, families and communities increased on emergency health care and mental health burden created by insurgency. There is urgent need of public health approach to be expanded beyond treatment for individuals who are most severely affected to comprehensive prevention and health promotion.

Acknowledgments

We express appreciation to the Deep South Co-ordination Center (DSCC), Faculty of Science and Technology, Prince of Songkla University, Pattani Campus, Thailand for generously providing the data, the Institute of Research and Development for Health of Southern, Thailand and the European Union (EU) for financial support.

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Province	RegionID: Districts	Population	
		Muslim	Total
Songkla	1: Chana/Thepha	94,178	156,799
	2: SabaYoi/Na Thawi	48,271	110,507
Pattani	3: Mueang Pattani	67,149	104,145
	4: Kok Pho/Mae Lan	40,816	75,628
	5: Nong Chik/Mayo/Kapho	61,305	70,118
	6: Yaring	79,051	81,495
	7: Panare/Sai Buri/Mai Kaen	88,471	108,188
	8: ThungYang Dang	69,745	73,545
	9: Yarang	73,919	78,740
Yala	10: Mueang Yala	79,343	154,634
	11: Betong/Than To	31,487	68,193
	12: Raman	54,451	62,756
	13: Yaha/Kabang/Krong Pinang	50,522	56,546
	14: Bannang Sata	69,892	73,408
Narathiwat	15: Mueang Narathiwat	72,665	104,615
	16: Tak Bai	45,781	61,157
	17: Bacho/Yi-ngo	82,424	85,225
	18: Rueso	53,333	59,108
	19: Rangae	69,530	80,550
	20: SiSakon/Chanae	50,075	54,039
	21: Sukirin/Waeng	52,141	63,765
	22: Su-ngaiPadi/Cho-airong	75,688	89,251
	23: Su-ngaiKolok	41,317	64,640
	Total Muslim Population	1,451,554	1,937,052

Table 1:Regions used in analysis of Muslim victims of terrorism in southern Thailand

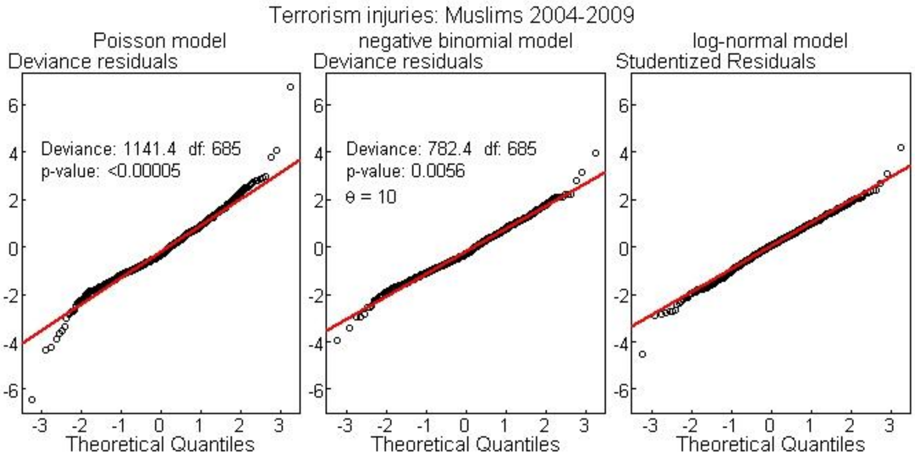

Figure 1: Residuals plots against normal quantiles for three statistical models fitted to injury rates of Muslim victims of terrorism in southern Thailand: 2004-2009.

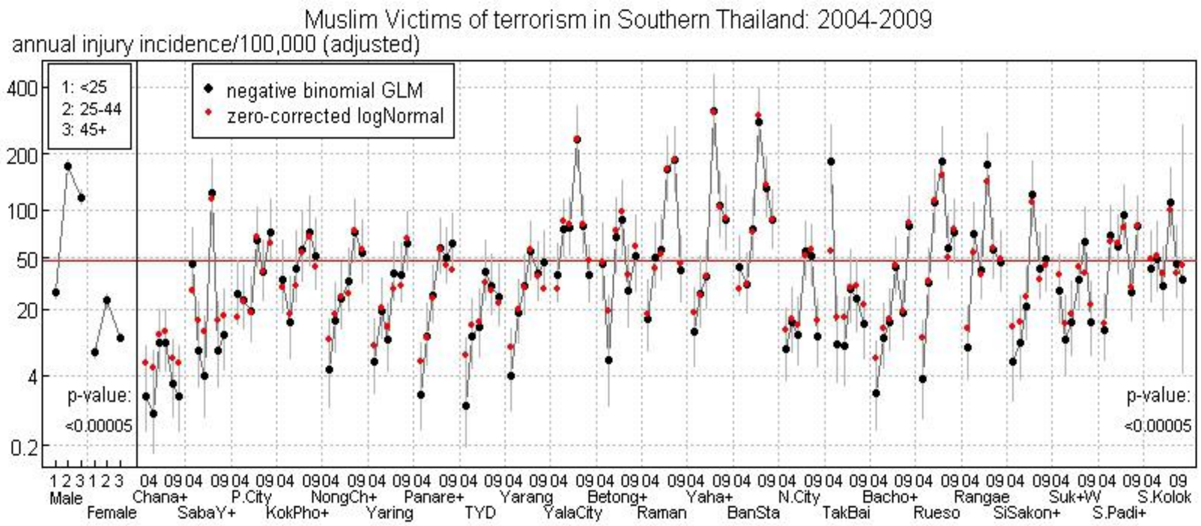

Figure 2: Plots of incidence rates by gender-age group adjusted for region-year (left panel) and for region-year adjusted for gender-age group (right panel), with 95% confidence intervals, for the negative binomial model with dispersion parameter θ = 10. The red-coloured points denote corresponding adjusted incidence rates based on the log-normal model.

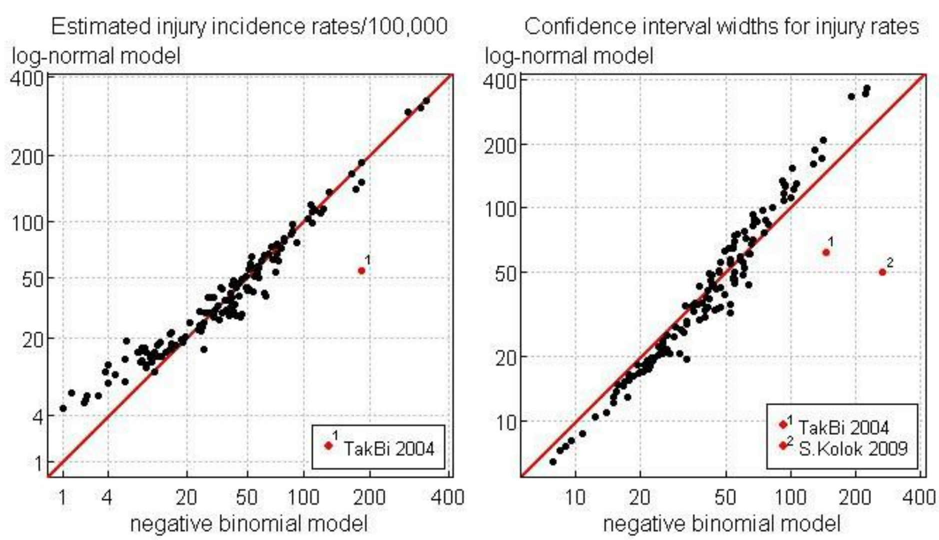

Figure 3: Comparison of incidence rates (left panel) and confidence interval widths (right panel) for log-normal and negative binomial models.