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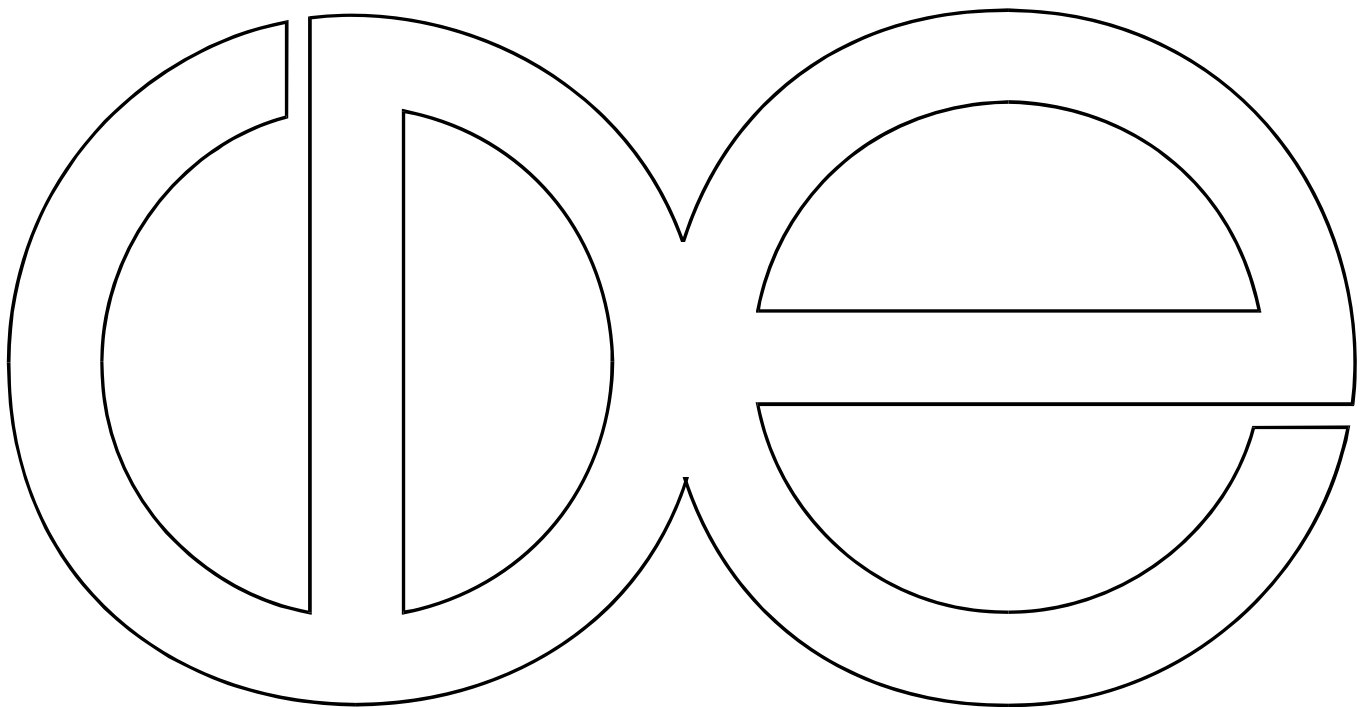
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The Differential Impact of Mortality of American Troops in the Iraq War: The Non-Metropolitan Dimension

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THE DIFFERENTIAL IMPACT OF MORTALITY OF AMERICAN TROOPS IN THE IRAQ WAR: THE NON-METROPOLITAN DIMENSION

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Considerable attention has been given to mortality among US troops in the Iraq War and, especially, the differential impacts of death among troops. Buzzell and Preston (2007) estimated the risk of death for troops according to several individual characteristics including military branch, rank, sex, age, and race. Results suggest that the greatest risk was experienced by the Marines, the enlisted, male troops, young troops, and Hispanic troops. Buzzell and Preston noted that some of the differences in risk of death correspond with trends in the larger society while others are specific to the military (e.g., branch and rank). Other researchers and journalists have focused on the potential differential impacts of deaths in the Iraq conflict for specific sub-populations of American society, namely rural communities and lower-income groups (e.g., Mark, 2007; O'Hare and Bishop 2006). In their 2006 report on rural soldiers, O'Hare and Bishop connect rural military involvement to poor economic opportunities that characterize many rural areas. The disproportionate impacts of deaths in Iraq are important to consider because they may perpetuate the conditions in rural communities that encourage rural youths to serve in the military and put themselves at risk of death.

We disaggregate mortality data by county non-metropolitan status to address the question of whether rural communities are more greatly impacted by mortality in the Iraq War compared to more urban communities. Our analysis covers all US military deaths since the invasion of Iraq, March 20, 2003, through December 31, 2007. Earlier reports have identified higher enlistment among rural youths as a potential explanation for greater impact. Relying on census definitions of metropolitan and non-metropolitan

counties,[2] we examine enlistment and death rates for all military personnel disaggregated by non-metropolitan status, in addition to several risk factors associated with higher death rates, namely military branch and rank within branch. The approach enables us to examine the extent to which the human costs of the Iraq War differentially impact rural communities. Non-metropolitan/metropolitan and rural/urban schemes do not perfectly align. The designations, however, do correlate with one another and we use the term non-metropolitan as a parallel to rural.[3]

Disaggregated death rate of US military personnel in Iraq

Since the Iraq War began, 3,853 deaths of US troops occurred between March 20, 2003, and December 31, 2007. Of these, 898 (23%) deaths were troops from non-metropolitan counties. Following Buzzell and Preston, we examine the cause-specific rate of death using person-years lived as the denominator,[4] which is derived from the quarterly count of troop strengths in Iraq reported by the Department of Defense.[5] We

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[2] We rely on ERS non-metro/metro designations (http://www.ers.usda.gov/Data/TypologyCodes/). Accessed April 2008.

[3] "Metropolitan" and "non-metropolitan" is defined differently than "urban" and "rural." Metro counties are defined as having an urbanized area, and all counties are determined to be either metro or non-metro. Urban populations are classified by more stringent rules based on population density thresholds. County populations are described as being "percent urban" or "percent rural." (http://www.ers.usda.gov/Briefing/Rurality/NewDefinitions/ and http://www.ers.usda.gov/Briefing/Rurality/WhatisRural/). Accessed May 2008.

[4] Person-years were calculated using the linear interpolation method described in Preston, Heuveline, and Guillot (2001).

[5] Following Buzzell and Preston (2007), we drew data on deaths and military personnel from the following websites: iCasualities (http://icasualities.org/oif/Details.aspx); Department of Defense list of deaths by

further disaggregate the death rates by non-metro status of the reported home county for each deceased troop member. Cause-specific death rates for the Iraq troops and civilian population (age 20-34) are reported in Table 1.

[Table 1 about here]

A higher death rate is observed for the non-metro sub-population of military troops and the civilian population across all causes of death. As reflected in Buzzell and Preston's earlier work, non-combat (i.e., accidents, suicides, and homicides) and disease related deaths are higher among the US population than the military population. The US non-metro population has higher death rates relative to the metropolitan population, especially violent deaths. Data from the National Center for Health Statistics (Eberhardt et al. 2001) show that deaths from accidents and suicides are higher among non-metro populations whereas homicides are notably higher for metro populations.

The troop data also show that military personnel from non-metro areas are at a disadvantage relative to troops from metro counties. Non-metro troops have a higher death rate than metro troops despite the lower death rate due to non-combat violence within the military population (the observed difference in deaths from disease are not statistically significant). The disparity is especially pronounced for non-combat violent deaths. So while the military population has a lower rate of death to non-combat violence, troops from non-metropolitan counties have a smaller advantage over their

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date (http://siadapp.dior.whs.mil/personnel/CASUALTY/oif_date_of_death_list.pdf). Data on troop strength by service and date was available through the Department of Defense website (http://siadapp.dmdc.osd.mil/personnel/MILITARY/Miltop.htm). All sites were accessed April 2008.

civilian counterparts relative to the advantage observed for troops coming from metropolitan counties.

Moreover, and more pertinent to popular discussions about the imbalanced costs of war, a markedly higher combat death rate is observed for non-metro troops compared to metro troops. The total death rate for all troops in Iraq due to combat is 3.43 per 1,000 troops. Yet the combat-related death rate for non-metro troops is 4.09 per 1,000.

All causes combined, the total death rate for non-metro troops is just over 5 deaths per 1,000 troops. In contrast, the total death rate for metro troops is 4 deaths per 1,000 troops. The higher death rate for non-metro troops supports the argument that the consequences of war are disproportionately felt by non-metropolitan communities. The difference in death rates is a single person, yet the raw numeric impact of loss is greater on a non-metro community than a metro community due simply to the lower population concentration that, in part, defines non-metro communities. There are dramatic consequences for the families and friends of the deceased, regardless of community size. Yet it is reasonable to anticipate that each death has a greater impact on the wider community in non-metro areas given the numeric dynamics and, potentially, the density of kinship and social network characteristics of less urban places (Curtis White and Guest 2003).

The general ranking of mortality by branch of service, reported in Table 2, is consistent with Buzzell and Preston's analysis through September 30, 2006. Marines have the highest death rate of all branches; the death rate among Marines is nearly twice that of the next highest branch, the Army. The rankings persist when

disaggregating the troop population by non-metro status; Marines have the highest

death rate for all non-metro and metro troops followed by Army troops. There is no

statistical difference in the death rates between non-metro and metro Marines. Still,

non-metro Army troops and all non-metro troops from all branches combined have a

higher death rate than metro troops. The ratio of deaths further highlights the

differences experienced by non-metro troops. For example, Army troops have a higher

death rate than Navy and Air Force troops, and a larger ratio of these deaths is

comprised of troops from non-metro counties. The higher death rates observed for non-

metropolitan troops, again, shows the differential impacts of the Iraq War felt by non-

metro communities.

[Table 2 about here]

Differences in the impacts of death in the Iraq War are further illustrated in Figure

1. The number of combat deaths per county population age 20-34 is plotted for all US

counties.[6] Shaded counties have suffered at least one death in Iraq; the lightest shading

corresponds with counties losing the equivalent of less than .05% of its age-specific

population, whereas the darkest shade highlights counties that have lost the equivalent

of more than 1% of its age-specific population (the highest proportion observed was

Mineral County, Colorado at 1.1%). Counties with no shading suffered no loss as of

December 31, 2007. For almost all (97%) metro counties, the impact of losses in Iraq is

equivalent to less than .05% of its population (age 20-34) whereas only .1% lost the

equivalent of 1% of their populations. In comparison, while most non-metro counties

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[6] The values in Figure 1 represent the total number of military combat deaths per population age 20-34 for each county and, thus, differ from the death rates reported in Tables 1 and 2.

suffering military deaths fall within the lower-impact category, 18% of non-metro

counties fall within the higher-impact categories; 6% of which lost the equivalent of 1%

or more of their populations. This is intuitive given the smaller population base on which

military deaths are applied, yet the social and economic implications for these

communities cannot be dismissed and likely are magnified by the lower population size.

[Figure 1 about here]

Deaths in the Iraq War are not evenly distributed across US counties. The South

has higher enlistment than any other region in the US (Kane 2006; Segal and Segal

2004), yet only counties in Texas suffered the highest relative loss. The higher-impact

category is largely concentrated in the Great Plains (which includes Texas) and Upper

Midwest regions. Of the states within these regions, however, only Montana has been

identified as having one of the highest numbers of recruits relative to the youth

population (Kane 2006; Segal and Segal 2004).

Understanding higher non-metro death rates

Disproportionate enlistment is often identified as a potential explanation for the

non-metro communities experiencing the brunt of military deaths. It is important to note,

however, that the disaggregated death rates account for uneven enlistment between

non-metro and metro counties. The rates are standardized and, thus, hold the base

population constant; the death rate is 5 per 1,000 for non-metro troops and 4 per 1,000

for metro troops. Still, we examine differences in enlistment according to two

dimensions used in earlier research: non-metro/metro status and rural concentration.

The non-metro/metro distinction, as before, is based on census definitions. Rural

concentration reflects the proportion of the county total population that resides within rural areas.[7,8]

Enlistment for 2004-05 by place type is reported in Table 3.[9] The percentage representation of recruits coming from non-metro counties is relatively consistent across the military branches and is proportionate to the US non-metro population. Non-metro enlistment is highest for the Air Force (21% of all enlistment), yet there is only a 3 percentage-point range across the branches (18% of all Navy enlistment is non-metro). Census figures show that about 20% of the US total population is non-metro and 17% of the US population age 18-24 is rural (U.S. Census Bureau 2002). The ratio of enlistment relative to the youth population (age 18-24), also reported in Table 3, suggests that enlistment is overrepresented among non-metro troops across all branches. The overrepresentation is especially pronounced for Army and Air Force recruits (a 22% and 23% proportional overrepresentation, respectively).

[Table 3 about here]

The ratio of recruits to the population is unevenly distributed across the rural concentration continuum. Larger proportions of recruits come from more urban counties (especially counties with less than 10% of the population living in rural areas). Yet

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[7] We depart from Kane's (2006) measure of rural concentration by treating the county as the unit of observation rather than Zip Code Tabulated Areas (ZCTA).

[8] "Urban" and "rural" are Census 2000 definitions based on population density. See: http://www.census.gov/geo/www/ua/ua_2k.html

[9] We rely on enlistment data from the National Priorities Project (http:// http://www.nationalpriorities.org/nppdatabase_tool) used in the popular media and by Kane (2005; 2006). Data were accessed April 2008.

recruits are proportionately overrepresented among more rural counties. For example, Army enlistment among the most rural counties was 38% higher than their youth populations. It was 54% higher among counties with 90-99% rural population. The proportion of recruits generally increases linearly as rural concentration increases and the pattern is observed across all military branches.

Kane (2006) finds similar results when examining Zip Code Tabulated Areas (ZCTA). ZCTA capture populations at a finer scale of geography, yet data on troop deaths are not available by zip code. We maintain our analysis of enlistment at the county level because it corresponds with the analysis of troop mortality.

We disentangle the role of mortality and enlistment to further illustrate the differential impacts of mortality for non-metro troops and, in turn, their communities.[10] The estimates reported in Table 4 are calculated from data on Army deaths and enlistment between 2004 and 2007 since data was consistent for this branch and time period. Results reinforce the point that enlistment is considerably higher among non-metro communities and that mortality is higher for troops coming from non-metro communities. The total impact of the differential deaths and enlistment is three times higher for troops coming from non-metro communities compared to troops from metro communities (.20 versus .06).

[Table 5 about here]

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[10] Impact is expressed as mortality multiplied by enlistment where mortality is calculated as deaths by county divided by enlisted troops by county and enlistment is calculated as enlisted troops by county divided by county population age 20-34.

Differences in enlistments, however, cannot explain differences in death rates because the rates account for any inequality in enlistment across the non-metro and metro populations.[11] We focus our attention on one of the risks identified in the analysis conducted by Buzzell and Preston: rank. They state that "[o]ne of the oldest observations in the social sciences is that lower-ranking individuals experience a greater risk of death than higher-ranking individuals" (2007:559). Buzzell and Preston find that enlisted troops in the Iraq War have significantly higher mortality than officers. For example, among Army troops, the enlisted have 38% higher mortality than officers and, among the Marines, the enlisted have 33% higher mortality. Some have suggested that individuals from non-metro areas tend to enlist in the military as a means of gaining training and education (e.g., O'Hare 2006). This would imply that non-metro troops enter the military as enlisted personnel (rather than as officers) and at lower ranks.

We examine whether a greater share of non-metro deaths are concentrated among enlisted and lower ranked troops. We disaggregate the number of deaths and calculate the proportion of deaths by rank for non-metro and metro troops. Results in Table 5 show mixed support.[12] In general, a similar pattern of mortality is observed by

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[11] A recent article in the New York Times reported that about 38% of active-duty soldiers who have served in Iraq since 2003 have been deployed more than once (Shanker 2008; http://www.nytimes.com/2008/04/06/washington/06military.html?ex=1365134400&en=d1f48ac4ce0f767c &ei=5088&partner=rssnyt&emc=rss, accessed May 2008). No reports or studies were found to address whether there is a disproportionate likelihood of repeat tours among rural troops which, in turn, would increase their exposure to the risk of death.

[12] Our relative risk calculations use total deployments as the denominator, in keeping with the methodology of Buzzell and Preston (2007). Total deployments were calculated by applying the number

rank for non-metro and metro troops. Still, relative to metro troops, a greater concentration of deaths is found for non-metro troops in the Army, specifically among enlisted non-metro troops in the Army and, more specifically, Army Sergeants; 37% of all non-metro deaths are concentrated among Army Sergeants compared to 30% of all metro deaths. There is negligible difference between the proportions of total deaths among the lower ranked enlisted Army personnel. Similarly, there is little observed difference between non-metro and metro Army officers or among Marines, enlisted or officers. The differences between non-metro and metro mortality appear to be concentrated among Army Sergeants.[13]

[Table 5 about here]

We further examine mortality by calculating the relative risk of death for non-metro troops by deployment and find additional evidence of a non-metro/metro disparity within rank. Results, also in Table 5, show that the relative risk of mortality is generally higher for non-metro enlisted troops and lower for non-metro officers. Differences are especially pronounced among Army troops; non-metro enlisted troops have a 31% greater risk of mortality relative to their metro counterparts. Among Army Sergeants, troops with the highest proportion of total deaths, non-metro troops have a 48% greater

of deployments in a year by branch of service to the person-years lived in that branch. We adjust for changes in deployment lengths over the course of the Iraq War.

[13] We also examined metro/non-metro deaths disaggregated by age, given popular media focus on recruitment of rural youths, but found no significant mortality differentials. Troops from non-metro areas had a higher relative risk of death in all age ranges, yet the proportions of deaths to total deaths in each group were comparable across metro/non-metro status. Nearly half of all fatalities were concentrated in the 20-24 age grouping and the mode age of death was 21 for non-metro and metro troops.

risk of dying than metro troops. Yet, among officers, non-metro troops have a 15%

lower risk of death than metro troops. The non-metro advantage increases with rank.

We examined mortality by age, race and sex and did not find any indication that these

demographic factors explained the non-metropolitan/metropolitan differences.

Conclusion

The disaggregated analysis of mortality among US military troops suggests that

non-metro areas are experiencing a higher cost of the Iraq War. Troops from non-metro

counties have higher rates of death regardless of cause or military branch. The greatest

impacts of military deaths are felt among non-metro counties, with the largest brunt

experienced among counties within the Great Plains and Upper Midwest regions.

Death rates inherently adjust for differential enlistment, suggesting that non-

metro troops are at a greater risk of death after accounting for higher enlistment. This is

an especially important point because enlistment receives central focus in popular

accounts of differences in military deaths.

Military deaths were largely concentrated among Army personnel for non-metro

and metro personnel, although a higher concentration is observed for non-metro troops,

especially enlisted Army Sergeants; nearly 40% of all non-metro deaths are

concentrated among this group. The relative risk of death is higher among non-metro

enlisted troops and lower among non-metro officers compared to metro troops. The

non-metro disadvantage in risk of death decreases with rank; rural officers appear to

have an advantage over their more urban counterparts.

These data limit our ability to comment on why non-metropolitan troops

experience higher death rates. Perhaps there are systematic differences in the quality of

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training, the riskiness of missions, or other factors that put non-metropolitan troops at greater risk of mortality compared to metropolitan troops. Results demonstrate a heightened risk is worthy of focus in future research.

As Buzzell and Preston note, death is just one of the potential outcomes of military service. Injuries, physical and psychological, are other likely consequences of war. Each outcome has important implications for the individual as well as the community to which s/he returns, including the extent to which support services are available to such personnel and her/his family (Helseth 2007a). Indeed, some reports suggest that service providers in rural areas are not directly serving their communities because they have been deployed to Iraq and Afghanistan (Helseth 2007b). This is yet another potential aspect by which the effects of war differently impact smaller communities.

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Table 1. Comparison of death rate by general cause among troops in Iraq to death rate of US population by non-metro/metro status: Iraq War, 20 March 2003 - 31 December 2007

	Annual death rate per 1,000			
	Combat deaths	Non-combat violent deaths	Deaths from disease	Total
Death rate among troops in Iraq				
Total	3.43	0.58	0.20	4.20
Metro	3.27	0.54	0.19	4.00
Non-metro	4.09	0.71	0.22	5.01
US sex-standardized death rate, ages 20-34, 2003				
Total	-	0.90	0.42	1.32
Metro	-	0.86	0.42	1.28
Non-metro	-	1.11	0.45	1.55

Note: All non-metro/metro differences are statistically significant with the exception of deaths from disease for troops in Iraq.

Table 2. Death rate and relative mortality levels by military branch and non-metro/metro status, Iraq War, 20 March 2003 - 31 December 2007

	Annual death rate per 1,000			Ratio of death rate to total death rate	
	Non-metro	Metro	Total	Non-metro	Metro
Army	5.44	4.31	4.54	1.20	0.95
Marine Corps	8.38	7.69	7.82	1.07	0.98
Navy	1.23	0.86	0.93	1.32	0.93
Air Force	0.62	0.44	0.48	1.30	0.92
Total	5.01	4.00	4.20	1.19	0.95

Note: Non-metro/metro differences in death rates are statistically significant for Army and total deaths.

Table 3. Military enlistment by county non-metro/metro and rural concentration status for all military branches, 2004-2005

	Percent of Recruits				Ratio of Recruits to Population Age 18-24			
	Army	Marines[a]	Navy	Air Force	Army	Marines[a]	Navy	Air Force
Total Number	129,054	37,995	75,842	52,777				
Non-metro	20%	19%	18%	21%	1.22	1.12	1.09	1.23
Metro	80%	81%	82%	79%	0.96	0.98	0.98	0.95
Rural Concentration[b]								
0 (all urban)	3%	3%	4%	2%	0.59	0.47	0.69	0.33
.00-.09	41%	44%	44%	40%	0.89	0.95	0.97	0.87
.10-.19	14%	14%	13%	15%	1.05	0.99	0.97	1.09
.20-.29	9%	10%	9%	10%	1.13	1.15	1.04	1.20
.30-.39	8%	8%	7%	9%	1.07	1.04	1.00	1.21
.40-.49	6%	6%	6%	6%	1.15	1.16	1.08	1.25
.50-.59	5%	5%	5%	5%	1.22	1.14	1.13	1.23
.60-.69	5%	4%	4%	5%	1.35	1.21	1.15	1.35
.70-.19	3%	3%	3%	3%	1.24	1.16	1.19	1.26
.80-.89	2%	2%	2%	2%	1.52	1.55	1.43	1.50
.90-.99	1%	1%	1%	1%	1.54	1.42	1.47	1.39
1 (all rural)	2%	2%	2%	2%	1.38	1.24	1.33	1.34

[a] Enlistment for 2005 only
[b] Census 2000 SF1, Broomfield County, CO, not included

Table 4. Impact, total and disaggregated by
enlistment and mortality for Army troops, 1
January 2004 and 31 December 2007

	Mortality (per 1,000)	Enlistment (per 1,000)	Impact (per 1,000)
Non-metro	16.40	12.01	0.20
Metro	14.12	4.50	0.06

Note: All non-metro/metro differences are
statistically significant.

Table 5. Number of deaths and relative mortality levels per deployment by military branch, rank and non-metro/metro status, Iraq War, 20 March 2003 - 31 December 2007

	Number of deaths			Proportion of Total Deaths		Relative Risk of Death Per Deployment
	Non-metro	Metro	Total	Non-metro	Metro	Non-Metro to Metro
Army (Active, Guard, Reserve)	**669**	**2,075**	**2,744**	**0.74**	**0.70**	**1.26**
Enlisted	620	1,850	2,470	0.69	0.63	1.31
Private, Private E-2	20	66	86	0.02	0.02	1.19
Private First Class	106	319	425	0.12	0.11	1.30
Corporate/Specialist	164	593	757	0.18	0.20	1.08
Sergeant[a]	330	872	1,202	0.37	0.30	1.48
Officer	49	225	274	0.05	0.08	0.85
Second Lieutenant, First Lieutenant	21	73	94	0.02	0.02	1.13
Captain	8	76	84	0.01	0.03	0.41
Major, Colonel, General[b]	5	37	42	0.01	0.01	0.53
Warrant Officer	15	39	54	0.02	0.01	1.51
Marines (Active, Reserve)[c]	**196**	**780**	**976**	**0.22**	**0.26**	**1.09**
Enlisted	185	722	907	0.21	0.24	1.11
Private, Private First Class	19	64	83	0.02	0.02	1.29
Lance Corporal	86	354	440	0.10	0.12	1.05
Corporal	47	176	223	0.05	0.06	1.16
Sergeant[d]	33	128	161	0.04	0.04	1.12
Officer	11	55	66	0.01	0.02	0.87
Second Lieutenant, First Lieutenant	5	22	27	0.01	0.01	0.99
Captain	4	23	27	0.00	0.01	0.75
Major, Colonel, General[e]	2	10	12	0.00	0.00	0.87
Navy (Active, Reserve)	**21**	**66**	**87**	**0.02**	**0.02**	**1.43**
Air Force (Active, Guard, Reserve)	**12**	**33**	**45**	**0.01**	**0.01**	**1.41**
All[f]	**898**	**2,955**	**3,853**			**1.25**

[a] Includes Sergeant, Staff Sergeant, Sergeant First Class, Master Sergeant, and Sergeant Major
[b] Includes Major, Lieutenant Colonel, Colonel, Brigadier General, Major General, Lieutenant General, and General
[c] Total includes 3 Warrant Officer
[d] Includes Sergeant, Staff Sergeant, Gunnery Sergeant, Master Sergeant, and Sergeant Major
[e] Includes Major, Lieutenant Colonel, Colonel, Brigadier General, Major General, Lieutenant General,
[f] Metro total Includes one Coast Guard death

Combat Deaths per County Population (age 20-34)

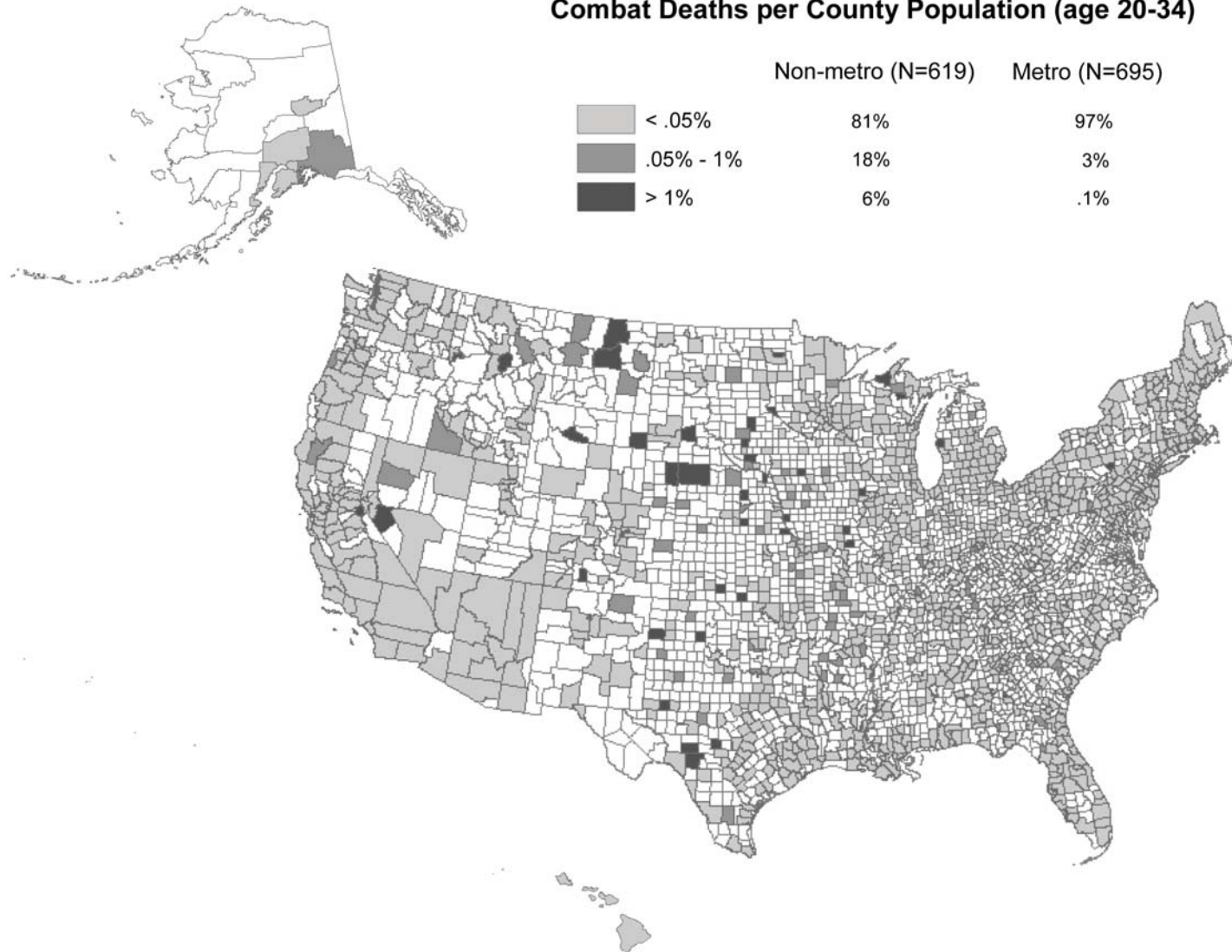|		Non-metro (N=619)	Metro (N=695)
	< .05%	81%	97%
	.05% - 1%	18%	3%
	> 1%	6%	.1%

Figure 1. Distribution of combat deaths per county population, Iraq War, 20 March, 2003 – 31 December, 2007

Note: Total combat deaths between March 20, 2003 and September 30, 2007 (iCasualties) and county population in 2000 (U.S. Census Bureau)