Final Progress Report: Grant R49-CCR019744-02

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Final progress report for Grant R49-CCR019744-02: Alcohol and traffic crash fatalities

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This grant had an extension until 9/30/2005. It has now been completed and this is a summary of the work that was done. Eight papers have been published that were supported by this grant and a ninth has been submitted for review. And additional paper has been published that relied on methods that were developed under this grant and 2 more are under review.

Methods for matched cohort data:

Many papers in the crash literature use the "double-pair" method. Colleagues and I showed that the double-pair method may be thought of as an analytic method for matched cohort data. More flexible regression methods, such as conditional Poisson regression, can be used to estimate risk ratios among occupants of the same vehicle:

1. Cummings P, McKnight B, Weiss NS. Matched-pair cohort methods in traffic crash research. *Accid Anal Prev* 2003;35:131-141.
2. Cummings P, McKnight B, Greenland S. Matched cohort methods in injury research. *Epidemiol Rev* 2003;25:43-50.

Estimates of association using matched cohort methods:

1. Cummings P, McKnight B, Rivara FP, Grossman DC. Association of driver air bags with driver fatality: a matched cohort study. *BMJ* 2002;324:1119-1122. The average risk of driver death was reduced 8% (95% CI 4% to 12%) by an air bag.
2. Norvell DC, Cummings P. Association of helmet use with death in motorcycle crashes: a matched-pair cohort study. *Am J Epidemiol* 2002;156:483-487. The adjusted risk ratio for death for a helmeted rider compared with an unhelmeted rider was 0.61 (95% CI 0.54 to 0.70).
3. Cummings P, Wells JD, Rivara FP. Estimating seat belt effectiveness using matched-pair cohort methods. *Accid Anal Prev* 2003;35:143-149. The risk ratio for death among belted compared with unbelted occupants was 0.39 (95% CI 0.37 to 0.41)
4. Cummings P, Rivara FP. Car occupant death according to the restraint use of other occupants: a matched cohort study. *JAMA* 2004;291:343-349. The risk of death was greater for a restrained front occupant in front of an unrestrained occupant compared with a restrained front occupant in front of a restrained occupant: adjusted risk ratio 1.20; 95% CI 1.10 to 1.31.

Studies of possible bias in estimation of seat belt effects. Police reports often misclassify unbelted vehicle occupants as belted; the degree of misclassification was greatest when occupants were not injured and less when at least one occupant died in the same car.

1. Cummings P. Association of seat belt use with death: a comparison of estimates based on data from police and estimates based on data from trained crash investigators. *Inj Prev* 2002;8:338-341.
2. Schiff M, Cummings P. Comparison of reporting of seat belt use by police and crash investigators: variation in agreement by injury severity. *Accid Anal Prev* 2004;36:961-965.

Study of changes in crash deaths:

The *final* manuscript that has been submitted for review is: Cummings P, Rivara FP, Olson CM, Smith KM. Changes in traffic crash mortality rates attributed to use of alcohol, or lack of a seat belt, air bag, motorcycle helmet, or bicycle helmet, United States, 1982-2001. Submitted. I attach a copy of this for your files. Please do not share this as it is now under review by a journal. The main findings were: "There were 858,741 traffic deaths during the 20-year study interval. Deaths attributed to each factor were: (1) alcohol use, 366,606, (2) not wearing a seat belt, 259,239, (3) lack of an air bag, 31,377, (4) no motorcycle helmet, 12,095, (5) no bicycle helmet, 10,552. Over the 20 years, mortality rates attributed to each risk factor declined: alcohol -53% (95% confidence interval [CI], -56, -49); not wearing a seat belt -49% (95% CI, -52, -47); lack of an air bag -17% (-38, +12); no motorcycle helmet -74% (95% CI, -81, -63); no bicycle helmet -39% (-45, -33). There were 153,168 lives saved by decreased drinking and driving, 129,297 by increased use of seat belts, 4305 by increased air bag prevalence, 6475 by increased use of motorcycle helmets, and 239 by increased use of bicycle helmets. **Conclusion** Decreased alcohol use by drivers and pedestrians and increased use of seat belts were associated with substantial reductions in crash mortality from 1982 through 2001. Increased presence of air bags, motorcycle helmets, and bicycle helmets were associated with smaller reductions."

I should mention that 3 other papers have been completed using methods that were developed under this grant:

1. Cummings P, McKnight B. Analysis of matched cohort data. Stata J 2004; 4:274-281.
2. Olson CM, Cummings P, Rivara FP. The association of first and second generation air bags with front occupant death in car crashes: a matched cohort study. Submitted 2005.
3. Smith KM, Cummings P. Passenger seating position and the risk of passenger death in traffic crashes: a matched cohort study. Submitted 2005.

The multiply imputed data that were produced under this grant should soon be freely available to researchers on the web site of the Harborview Injury Prevention & Research Center. As of today (9/27/05) they are not available, but the web master at HIPRC says this should occur soon. Researchers can download these files and link them to data from the Fatality Analysis & Reporting System. This will provide them with multiply imputed data for blood alcohol content, seat belt use, air bag presence, age, and sex.

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The original grant proposal outlined several results for alcohol-related deaths by age and other characteristics. Most of these results are in the final manuscript that was submitted for review. But I could not squeeze all of them into the final submitted manuscript. I attach a table of these results and a pdf file with the final manuscript:
Table for CDC of Alcohol deaths by age & group.pdf
Copy of cummings crash deaths 9 27 05 for CDC.pdf

Thank you for the support that was provided by this grant. The imputation project turned out to be far more work than I anticipated. But ultimately this turned out to be the most productive and interesting project I have ever done: 9 manuscripts (8 published so far) resulted from this grant and 3 more manuscripts (1 published so far) used methods developed under this grant. The multiply imputed data can be used for additional projects in the future by myself, others at HIPRC, and others who wish to use the freely available data.

If you need any further information, please let me know. I will send copies of this report in the mail. I will send copies attached to email today.

Gratefully yours,

Peter Cummings

Table 2. Alcohol attributable deaths and by age and subgroup. U.S. data, 1982-2001. Rates per 100,000 person-years. Driver and passenger categories exclude motorcyclists. Deaths attributed to drinking by each person and deaths attributed to drinking by another person sum to more than all alcohol deaths, because some deaths can be attributed to drinking by more than one person.

			All alcohol attributable deaths			Alcohol deaths attributed to drinking by the dead person			Alcohol deaths attributed to drinking by someone other than the dead person		
Group	Age (y)	All deaths	Alcohol deaths	Alcohol death rate	Alcohol deaths /all deaths (%)	Alcohol deaths	Alcohol death rate	Alcohol deaths /all deaths (%)	Alcohol deaths	Alcohol death rate	Alcohol deaths /all deaths (%)
All	0-15	67,853	14,399	1.21	21%	1,514	0.13	2%	13,096	1.10	19%
	16-20	130,914	57,514	15.11	44%	31,933	8.39	24%	28,311	7.44	22%
	21-30	210,147	122,476	15.12	58%	87,646	10.82	42%	42,879	5.29	20%
	31-64	321,169	151,790	7.17	47%	113,556	5.37	35%	49,303	2.33	15%
	65+	128,658	20,876	3.29	16%	11,001	1.74	9%	10,931	1.72	8%
	All ages	858,741	367,055	7.16	43%	245,650	4.79	29%	144,520	2.82	17%
Drivers	0-15	3,051	658	0.06	22%	575	0.05	19%	102	0.01	3%
	16-20	65,980	28,459	7.48	43%	25,426	6.68	39%	4,475	1.18	7%
	21-30	116,779	69,623	8.59	60%	64,261	7.93	55%	9,181	1.13	8%
	31-64	190,109	88,523	4.18	47%	77,671	3.67	41%	15,644	0.74	8%
	65+	67,736	10,447	1.65	15%	7,228	1.14	11%	3,675	0.58	5%
	All ages	443,655	197,709	3.86	45%	175,161	3.42	39%	33,078	0.65	7%
Passengers	0-15	38,369	9,832	0.83	26%	0	0	0%	9,832	0.83	26%

	16-20	44,261	19,668	5.17	44%	0	0	0%	19,668	5.17	44%
	21-30	45,549	24,706	3.05	54%	0	0	0%	24,706	3.05	54%
	31-64	53,295	20,738	0.98	39%	0	0	0%	20,738	0.98	39%
	65+	32,193	4,542	0.72	14%	0	0	0%	4,542	0.72	14%
	All ages	213,667	79,486	1.55	37%	0	0	0%	79,486	1.55	37%
Pedestrians	0-15	18,006	2,544	0.21	14%	552	0.05	3%	2,116	0.18	12%
	16-20	7,915	4,177	1.10	53%	3,011	0.79	38%	2,074	0.54	26%
	21-30	19,204	12,763	1.58	66%	10,927	1.35	57%	4,853	0.60	25%
	31-64	49,341	28,365	1.34	57%	24,196	1.14	49%	9,351	0.44	19%
	65+	26,669	5,571	0.88	21%	3,571	0.56	13%	2,578	0.41	10%
	All ages	121,135	53,418	1.04	44%	42,257	0.82	35%	20,972	0.41	17%
Motorcyclists	0-15	1,905	466	0.04	24%	172	0.01	9%	308	0.03	16%
	16-20	11,015	4,642	1.22	42%	3,216	0.84	29%	1,725	0.45	16%
	21-30	26,348	14,289	1.76	54%	11,685	1.44	44%	3,599	0.44	14%
	31-64	23,607	12,024	0.57	51%	10,093	0.48	43%	2,699	0.13	11%
	65+	936	137	0.02	15%	101	0.02	11%	41	0.01	4%
	All ages	63,811	31,558	0.62	49%	25,267	0.49	40%	8,371	0.16	13%
Bicyclists	0-15	6,522	899	0.08	14%	216	0.02	3%	738	0.06	11%
	16-20	1,743	568	0.15	33%	280	0.07	16%	369	0.10	21%
	21-30	2,267	1,096	0.14	48%	772	0.10	34%	539	0.07	24%
	31-64	4,817	2,140	0.10	44%	1,596	0.08	33%	872	0.04	18%
	65+	1,124	180	0.03	16%	102	0.02	9%	95	0.02	8%

	All ages	16,473	4,884	0.10	30%	2,965	0.06	18%	2,614	0.05	16%