Exploring the age discrepancy in death rates from motorcycle injury in the United States of America: the decomposition method

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Introduction Motorcyclist deaths accounted for 13% of all traffic deaths in 2009 in the United States of America. Previous research has suggested age discrepancy among motorcycle drivers. We examined the various factors that contribute to this age discrepancy.

Methods The decomposition methodology separates the individual components contributing to overall rates. It has been used to explore differences in injury death rates across population groups, time periods, and geographic regions. The populationbased motorcycle driver fatality rate (A: # motorcycle driver fatalities / # personyyears) can be expressed as the product of the driving exposure (B: # miles driven / # personyears), crash risk (C: # crashes / # miles driven) and crash fatality rate (D: # motorcycle driver fatalities / # crashes). Using ages 4049 as the referent group. We expressed the comparison of fatal crash involvement rates between the referent group and those aged 2029 years as a ratio:

$A_{2029} / A_{4049} = B_{2029} / B_{4049} \times C_{2029} / C_{4049} \times D_{2029} / D_{4049}$

The relative contribution (RC) of each component (B, C, or D) to the difference in motorcycle driver fatality rate is:

$RC_i = |In(RC_i)| / \{|In(RC_b)| + |In(RC_c)| + |In(RC_d)|\} \times 100\%$, *where i = b, c or d; In: natural logarithm*

Data sources included the 20082009 Fatality Analysis Reporting System (FARS), General Estimates System (GES), National Household Travel Survey (NHTS), and resident population estimates. FARS is a cencus of fatal crashes in the United States. GES is a nationally representative sample of policereported crashes. Respondents in the NHTS were instructed to keep a written diary of all the trips made during a randomly assigned 24hour travel day: information included trip prupose, transportation means, and trip length. The estimates of miles driven were obtained on the day trip diary.

Results Relative to ages 4049 years, the ratio of populationbased fatality rate was 0.39, 1.14, 0.93, 0.95, and 0.40 for ages of 1619, 2029, 3039, 5059, and 60 and over. Compared with persons aged 4049 years, the ratio of average annual miles driven was 0.13, 0.32, 0.41, 0.80, and 0.27 for ages 1619, 2029, 3039, 5059, and 60 and over; the ratio of crash risk was 4.81, 3.72, 2.40, 1.22 and 1.08 for ages 1619, 2029, 3039, 5059, and 60 and over; the ratio of crash fatality rate was 0.64, 0.96, 0.96, 0.97, 1.37 for ages 1619, 2029, 3039, 5059, and 60 and over. The relative contribution of driving exposure and crash risk was equally important for ages 2029, 3039, and 5059, while the relative contribution of crash fatality rate was 19% for age 60 and over.

Conclusions Motorcyle drivers aged 4049 years had the highest average annual miles driven and the lowest crash risk. For 2029 and 3039 year olds, reduced driving offset their high crash risk, making their fatality rate comparable to that for ages 4059. Prevention practice should focus on safety training and crash avoidance for motorcycle drivers aged 1619, 2029, and 3039 years to reduce their elevated crash risk. ■

Exploring the relationship between the driving behavior questionnair and hiway driving behavior

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The Driver Behavior Questionnair (DBQ) is a well documented instument for obtaining selfreport information on aberrant driving behaviors. The DBQ is comprised of three subscales: (a) errors – the failure of planned actions, which could result in unsafe driving; (b) violations – deliberate contravention of behaviors which are considered necessary for safe operation, and: (c) lapses – absentminded behaviors which are assumed unlikely to impact driving safety. A substantive body of research has demonstrated a relationship between DBQ scores and both retrospective and prospective accident involvement. In addition, DBQ subscale scores have been shown to have relationships with drivers' attitudes, personality characteristics, psychological wellbeing, demographics, etc. However, to the best of our knowledge, there is little or no published information on the relationship between DBQ scores and driving performance variables under actual driving conditions that may bear some relationship to accident risk.

The present study focuses on the relationship between DBQ subscales and highway driving behaviors. A sample of 108 drivers in selfreported good health and having a safe recent driving history (no accidents in the previous year) was balanced by gender and across three age groups (2029, 4049, 6069). Prior to driving, participants completed a 24item U.S. version of the DBQ. After approximately 30 minutes of driving an instrumented Volvo XC90, driving behaviors were assessed over an 18 minute period. During this time, participants were engaged in both periods of single task driving and driving while engaged in a structured working memory task requiring a division of attention. A dischotomous breakdoown of subscales of the DBQ (above or below the median) were independently examinded as predictors of driving behavior (average velocity, standard deviation of velovity, standard deviation of steering wheel position, hard braking, rapid throttle acceleration, and sudden unidirectional acceleration (the vector sum of longitudinal and lateral acceleration)).

Significant relationships were found to exist between subscales of the DBQ and actual driving behaviors. Drivers with high violations scores drove faster, had poorer lateral control (higher standard deviation of wheel position) and more sudden unidirectional accelerations. Among these factors, higher driving speed is known to influence the probability of accidents. The relationship between lateral control and sudden acceleration to accidents is less established but appears reasonable. High lapses scores were related to less consistent gas pedal control (larger standard deviation of velovity and more frequent periods of rapid throttle acceleration). It is interesting to speculate as to whether there is an attentinal factor that links the lapses score and these consistency of control measures. There were no main effects observed between errors scores and any of the driving behavior measures. Significant interactions in errors×gender on rapid