Analysis of Injuries Caused by Machines in Agriculture and Assessment of New Autonomous Agriculture Machines' Impact on Health and Safety

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Background: Agriculture remains one of the most hazardous industries in the United States, with machinery-related incidents responsible for a significant share of fatalities. Autonomous systems could potentially prevent certain fatal injury scenarios, yet national surveillance sources such as the Bureau of Labor Statistics'(BLS) Census of Fatal Occupational Injuries (CFOI) often lack the machine-specific detail needed for targeted prevention work. AgInjuryNews.org, which compiles media and public reports of agricultural injuries, provides richer detail at the machine and event level. The aim of this study was to assess whether AgInjuryNews can be used as a reasonable proxy for CFOI data in machinery-related fatality analyses.

Methods: We identified machinery-related fatalities in AgInjuryNews and coded them to the Occupational Injury and Illness Classification System (OIICS) variables "Primary Source" and "Event/Exposure" categories. Corresponding CFOI data for the same codes and time period were obtained. Comparisons between the two datasets included top-category overlap, Spearman's rank correlation, Pearson correlation, chi-square tests of distributional similarity, Cramér's V effect sizes, and calculation of scale factors. Analyses were conducted separately for Primary Source and Event/Exposure. Within the AgInjuryNews sample, we also identified event scenarios judged, through literature review and expert input, as preventable by full automation, and calculated the proportion of fatalities in validated machine categories that fell into those scenarios. Data normalization was done in both R and Excel. Data analysis was completed in Excel.

Results: For Primary Source, AgInjuryNews and CFOI showed strong agreement in category rankings (Spearman's $\rho = 0.71$, $p < 0.01$) and magnitudes (Pearson $r = 0.82$, $p < 0.01$). Distributional differences were present but modest (Cramér's $V = 0.27$). Agreement for Event/Exposure was weaker ($\rho = 0.36$, $r = 0.48$, $V = 0.31$). Overall, AgInjuryNews totals represented approximately 49% of CFOI counts for Primary Source and 57% for Event/Exposure. In the AgInjuryNews sample, 31% (95% CI: 25–39%) of fatalities in validated machine categories were associated with scenarios identified as preventable through full automation.

Conclusions: AgInjuryNews appears to be a suitable proxy for CFOI when examining machine-level fatality patterns, particularly for Primary Source categories. While Event/Exposure alignment is weaker, making mechanism-specific analysis less certain, the exploratory autonomy-prevention framework applied here suggests meaningful potential for reducing fatalities within validated machine groups. These findings support using AgInjuryNews as a detailed surveillance tool when calibrated to federal data and interpreted with attention to category-specific agreement.