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## Identifying Risk Factors of Productive Season Colony Loss in Ontario, Canada - A Multifactorial Epidemiologic Approach

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Concerns and reports of acute colony death, identification of weakened colonies, and widely fluctuating overwintering losses amongst honey bees continue to be reported by beekeepers in Ontario, and across Canada. Symptoms of weakened colonies have been described to include queen health issues, reduced productivity, increased susceptibility to pests and diseases, and reduced ability to overwinter. Declining pollinator health is multifactorial and complex. Epidemiological approaches to investigating diseases in other contexts (e.g., human health, or health of production animal species) have been powerful for investigating multiple risk factors using a variety of data types, including field data. Epidemiological studies investigating honey bee health issues are limited in Canada, but could prove useful in better understanding the complexities of health and disease in this population. A cross-sectional study was performed in Ontario, Canada, from March to May, 2015 to identify risk factors for colony losses during the productive season (i.e., spring to autumn). Management data from beekeeper questionnaires, geospatial bee-yard coordinates, and crop (corn, soybean) locations as an indicator of neonicotinoid use, were integrated and analyzed using multilevel multivariable logistic regression and spatial analysis. Respondents (n=309) represented 9.5% of the registered beekeepers in Ontario. The prevalence of colony mortality during the 2014 productive season was 23.4% (Confidence Interval: 19.4-27.3%). Further key results will be presented, including: differences in beekeeping outcomes between hobbyist and commercial operations; associations between beekeeper experience, management factors and colony mortality during the productive season; as well as associations between geographic proximity to corn and soy and honey bee health. These associations highlight the management and environmental factors of most impact to colony survival, and can inform future areas of research.