



Special Article: Seasonality in Romaine Outbreaks and Regional Shipments

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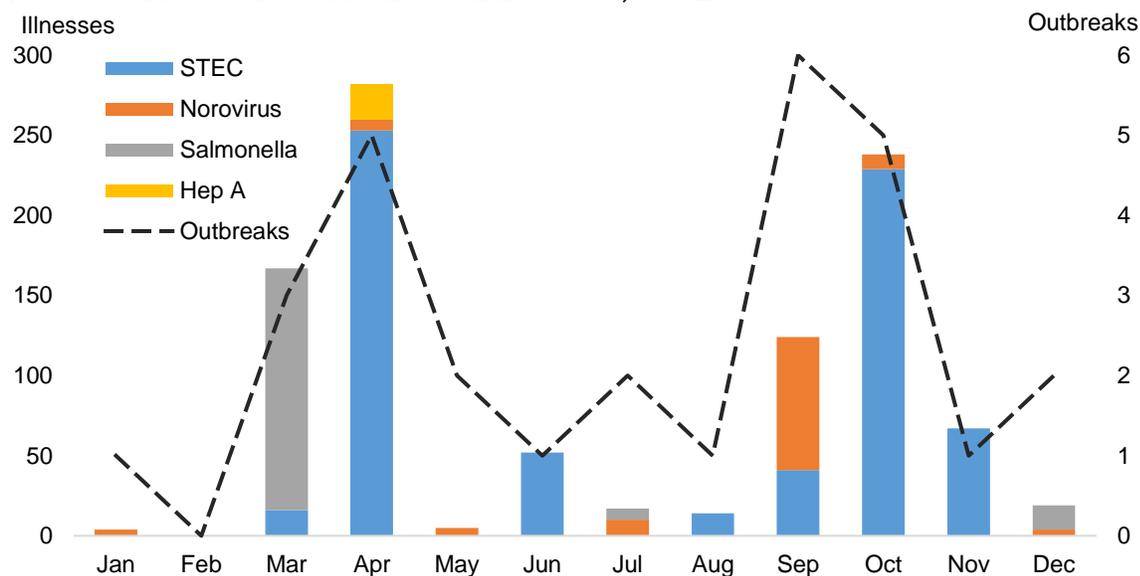
After the 2006 outbreak linked to spinach, the leafy greens industry established the California and Arizona Leafy Greens Marketing Agreements (LGMAs) to implement measures like harvest worker training and water testing to address safety concerns (Arizona LGMA, 2018; California LGMA, 2019a). While membership in an LGMA is voluntary, California and Arizona LGMA members produce the vast majority of the U.S.-grown leafy greens. In spite of these preventive measures, the industry still faces challenges with regards to foodborne illness outbreaks and has recently updated safeguards for water application to leafy greens (California LGMA, 2019b). Leafy greens are the sixth most commonly consumed vegetable (ERS, 2018a) and are commonly consumed raw. Since 1988, the amount of leafy greens consumed per capita has quadrupled (ERS, 2018b).

Seasonality in Romaine Outbreaks

While examples of leafy greens being associated with foodborne illness outbreaks go back to 1988 (Rosenblum et al., 1990), reliable data on foodborne illnesses attributable to specific foods goes back to 1998. From 1998 to 2018, foodborne illnesses and outbreaks associated with romaine lettuce occurred most frequently during March, April, September, and October (fig. 1). Illness counts of the bacterium responsible for the three 2017–2018 romaine outbreaks, Shiga toxin-producing *Escherichia coli* (STEC; *E. coli* O157:H7 is included among other strains), peak in April and October. Turner et al. (2019) analyze outbreaks associated with California leafy greens from 1996 to 2016 and find a similar seasonal pattern: outbreaks peak in October.

During 2017 and 2018 in the United States and Canada, there were three multi-State, multi-national foodborne disease outbreaks of STEC O157:H7 associated with the consumption of romaine lettuce that led to 376 illnesses, 158 hospitalizations, and 7 deaths. The timing identified in these three recent outbreaks fits a seasonal pattern of romaine outbreaks stretching back for two decades.

Figure 1
Foodborne illnesses and outbreaks in romaine lettuce, 1998-2018



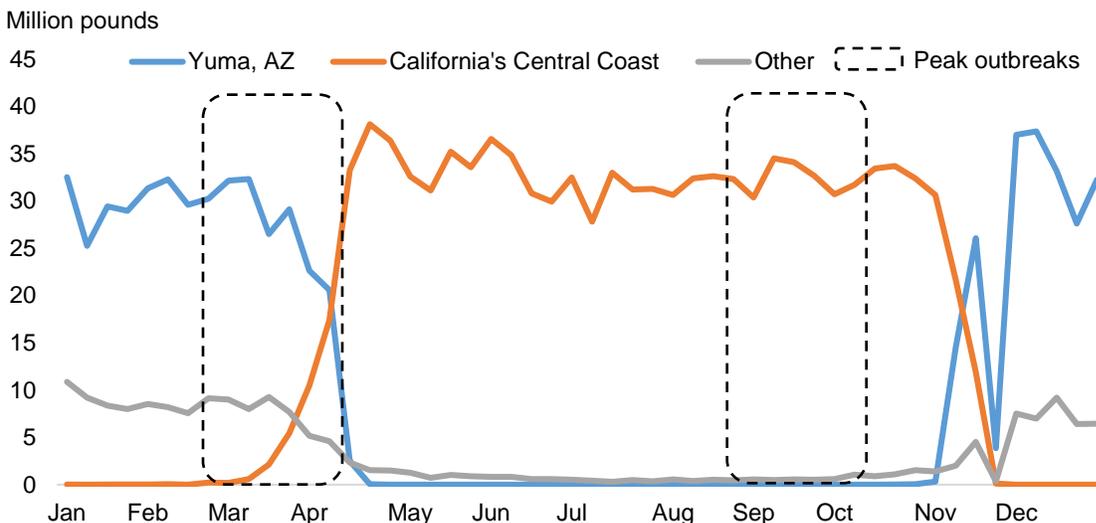
Sources: Author's calculations using data from Centers for Disease Control and Prevention (CDC, 2018a) for 1998–2017 and from CDC (2018b, 2018c, 2019) for 2017 and 2018.
 Notes: STEC: Shiga toxin-producing *Escherichia coli*. Hep A: Hepatitis A.

Seasonality in Romaine Shipments

About three-quarters of U.S. romaine shipments come from two regions commonly called California’s Central Coast and Yuma, Arizona; the rest come from other areas in the United States, Mexico, and Canada (fig. 2). The temperate climate of California’s Central Coast region, which includes the Salinas valley in Monterey County, is amenable to growing delicate lettuces during the summer and fall. Yuma, Arizona is generally hot and dry, but in the winter and spring temperatures are favorable for lettuce production and plentiful irrigation is available from canals fed by the Colorado River.

From about March to October, romaine comes predominantly from California’s Central Coast; during that time, no production occurs in Yuma. Production shifts quickly to Yuma in November, when Yuma production serves the market while production in California’s Central Coast ends. Another rapid shift back to California’s Central Coast begins in March. Outside of the two 1-month transition periods, these two dominant regions make up about 75 percent of shipments. Foodborne illness counts associated with romaine peak in March-April and September-October (fig. 1), prior to the seasonal transitions (fig. 2).

Figure 2
Seasonal variation in romaine shipments, 2018



Sources: Author's calculations using data from U.S. Department of Agriculture, Agricultural Marketing Service (2019).

Looking Forward

Definitive answers as to the cause of seasonality in romaine outbreaks are not provided here. However, the identification of a seasonal relationship between regional romaine production and foodborne illness outbreaks helps to formulate testable hypotheses with the potential to inform future romaine outbreak prevention. Both biophysical and operations management characteristics may vary seasonally in their impact on the likelihood of romaine contamination. Seasonality in the movement of both domestic and wild animals may affect the level of contamination reaching romaine in the field. Changes to management on the farm as romaine production winds down may affect the way food safety activities are carried out. Finally, seasonal temperature may impact both romaine production and bacterial growth. Further research is needed to determine which of these hypotheses impact foodborne illness outbreaks associated with romaine.

Suggested Citation

Astill, Gregory, Vegetables and Pulses Outlook, VGS-362-SA, May 6, 2019, U.S. Department of Agriculture, Economic Research Service.

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