

Whitehead and Lake (2018)¹: Summary of Main Findings

Raw milk demand and production continues to grow.

- Thirty two states had legal distribution of raw milk in 2004. This increased 34% to 43 in 2017.
- In nine states which issue licences and track active licenses, the number of licensed raw milk farms increased over from 76 in 2005 to 347 in 2017 (+357%).

There is no correlation between raw milk legalization and outbreaks.

- From 2010 to 2016, the number of U.S. states with legal raw milk distribution increased from 36 to 42 (+16.7%). Meanwhile, the number of outbreaks nation-wide decreased by 30%.
- Five states which had legalized raw milk had adequate outbreak data to do a before-and-after comparison. There was no change in the number of outbreaks (6 total in each 4 year period before and after) and actually a slight reduction in the relative rate when population was factored in.
- Assuming that the number of licences issued is a reasonable proxy for consumption, and factoring in national population growth of 9.3%, the ratio between outbreak rate and consumption rate shows a pronounced decline, with the 2016 outbreak-to-consumption ratio only 26% that of 2005.

On-farm food safety training is making a difference.

- Over 40 years ago, governments began helping food production and processing sectors develop and implement HACCP-based food safety programs. Declines in foodborne disease outbreak rates associated with specific sectors (e.g. meat processing) have been observed.
- In 2010, the Raw Milk Institute was founded and developed the first HACCP-based program for raw milk production. The same year, the Farm-to-Consumer Legal Defense Fund made available a video training course for farmers. Similar to what was seen in the meat processing industry, the availability of training correlates with a reduction in reported outbreaks.
- Data from Pennsylvania supports this connection. In November 2014, Pennsylvania State University's College of Agricultural Sciences hosted a workshop for producers in collaboration with the Raw Milk Institute. In addition, in 2014 the proprietor of the largest raw milk farm trained and listed with the Raw Milk Institute. An average of 2.6 outbreaks occurred each year in Pennsylvania from 2006 to 2014, then only one outbreak occurred in all of 2015 to 2017 – a reduction of 78%.

¹ Whitehead J, Lake B. Recent Trends in Unpasteurized Fluid Milk Outbreaks, Legalization, and Consumption in the United States. *PLOS Currents Outbreaks*. 2018 Sep 13. Edition 1. doi: 10.1371/currents.outbreaks.bae5a0fd685616839c9cf857792730d1. Available from: <http://currents.plos.org/outbreaks/article/recent-trends-in-unpasteurized-fluid-milk-outbreaks-legalization-and-consumption>.

Twelve-year timeline of outbreak rates, controlling for population:

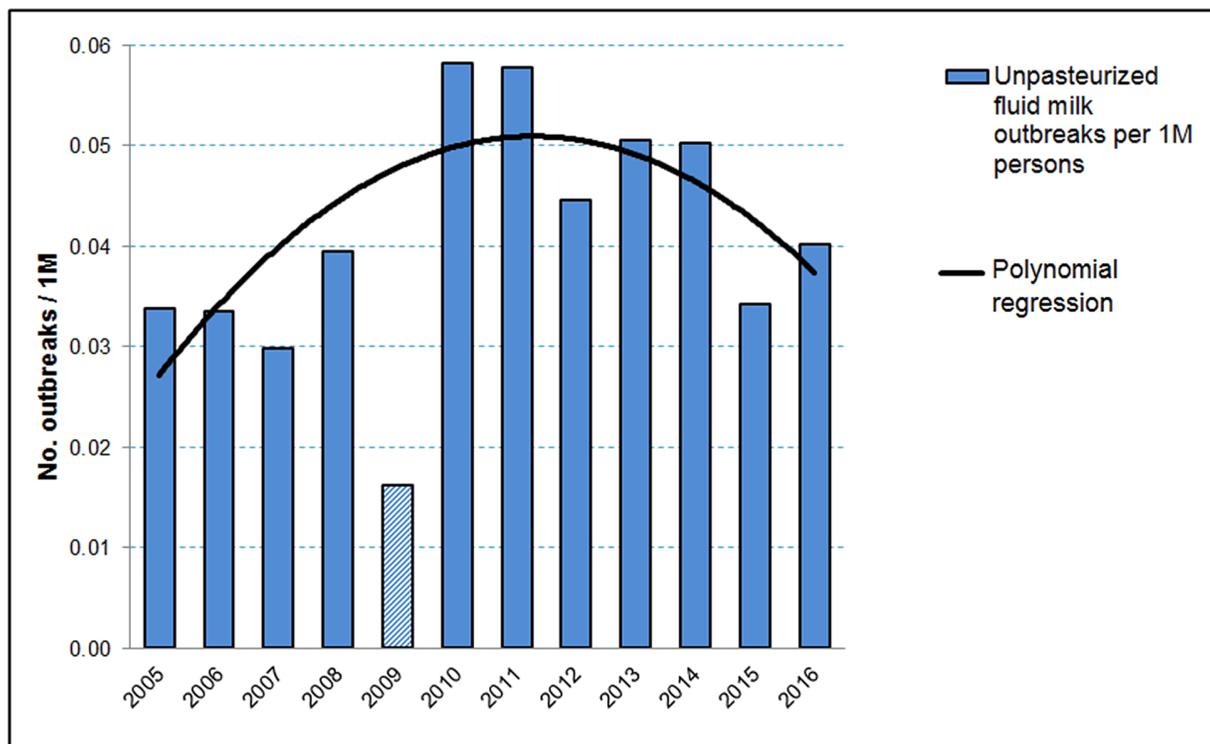


Figure 1: Outbreaks associated with unpasteurized fluid milk per million persons; plotted in Excel showing polynomial regression trend line. Outbreaks reported for 2009 provided to illustrate data quality issues specific to that year but excluded from further calculations. Data from the U.S. Census Bureau population estimates and the Foodborne Disease Outbreak Surveillance System, Centers for Disease Control and Prevention.

Legal availability of raw milk in the U.S. (2016):

Table 2: Legal availability of unpasteurized milk to consumers and percentage of the U.S. population living in states within that category (2016). Data from U.S. Census Bureau population estimates, National Association of State Departments of Agriculture unpasteurized milk surveys, state governments, and third-party websites.

Code	Availability to Consumer	Population Totals (2016)	Jurisdiction Count (2016)	Proportion of Total Population (2016)
R	Legal off-farm sales in retail stores, at farm markets, or both	88,365,997	12	27.3%
F	Farm-gate sales legal, but no off-farm sales	101,403,352	15	31.4%
H	Herdshares permitted by law or policy. Sales illegal.	56,547,195	10	17.5%
P	Farm-gate sales legal with "pet food" license	51,949,345	5	16.1%
I	Both herdshares and sales illegal.	24,861,624	9	7.7%
Total:		323,127,513	51	100%

Fourteen-year timeline of raw milk legalization in the U.S.:

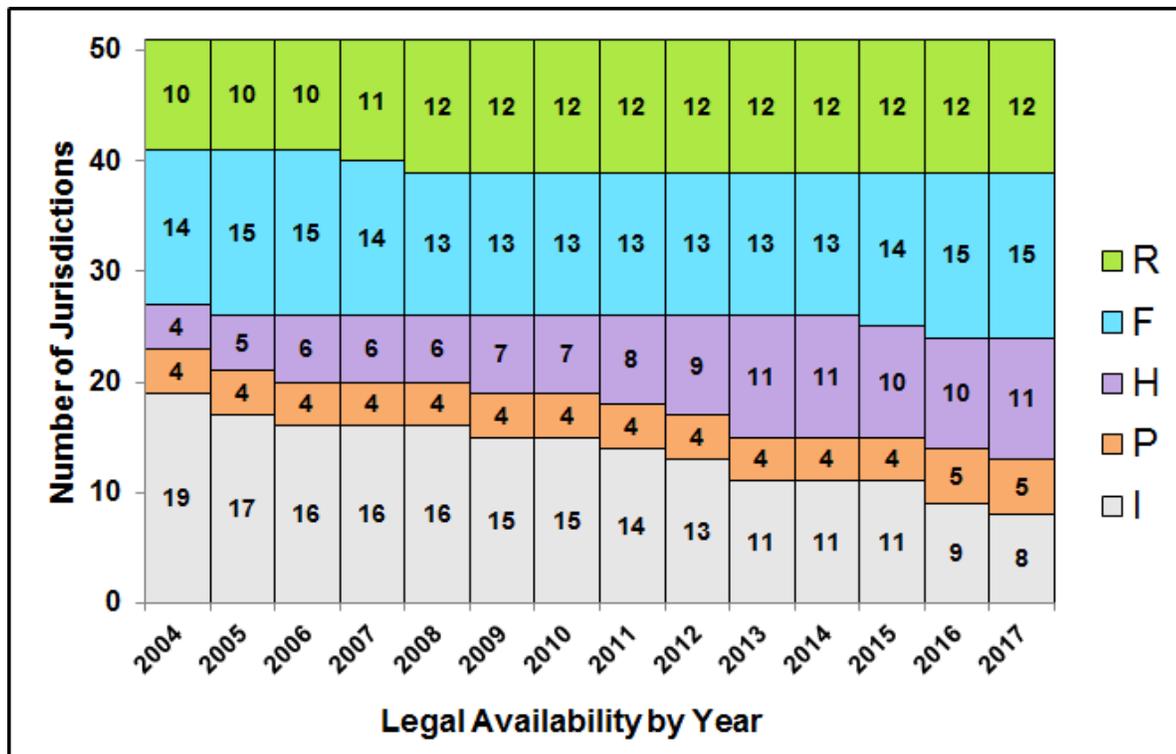


Figure 2: National trends in the legalization of unpasteurized milk in the U.S. (2004-2017), applying the legalization categories defined in Table 2. Legal status data from state governments, National Association of State Departments of Agriculture (NASDA) unpasteurized milk surveys, and third-party websites.

Twelve-year timeline of outbreak rates, controlling for population and estimated consumption increases:

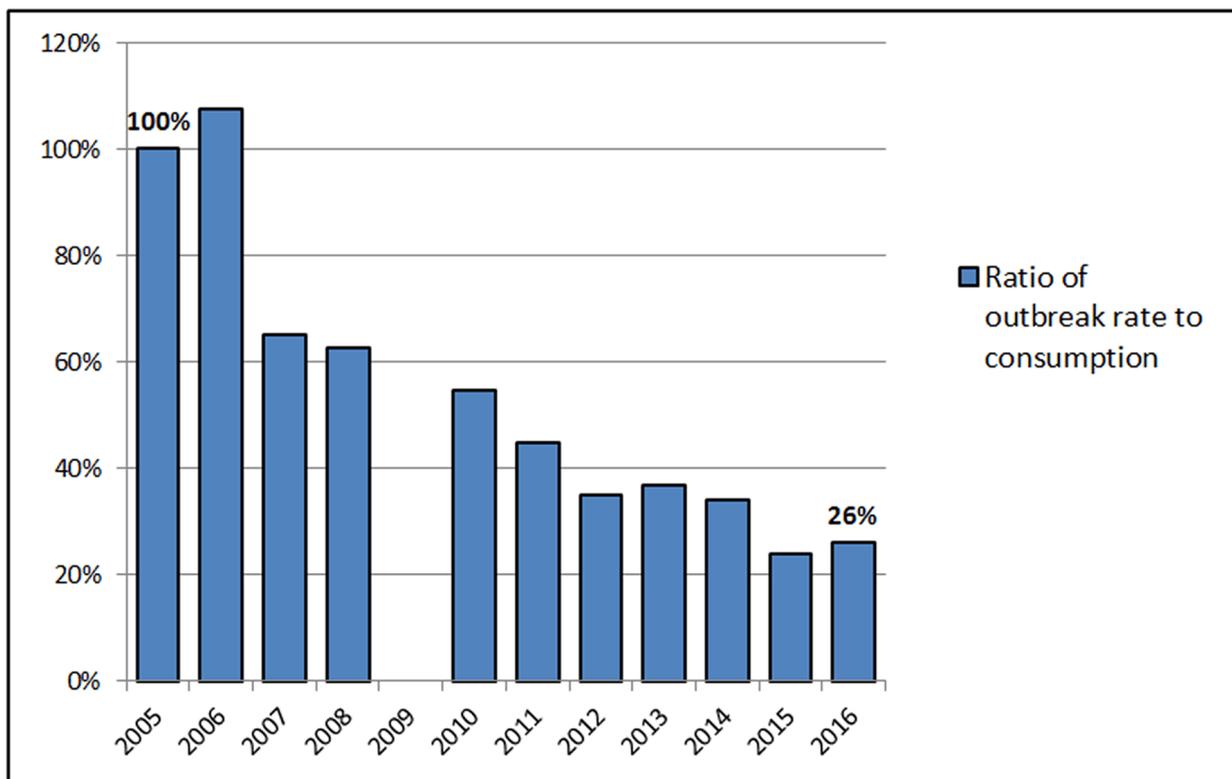


Figure 5: Estimated trend in outbreak rates controlling for population growth and estimated consumption rates, 2005-2016, scaled to show values relative to 2005. Data from the Foodborne Disease Outbreak Surveillance System, Centers for Disease Control and Prevention, U.S. Census Bureau population estimates, and state government licensing information.

Thirteen-year timeline of outbreaks and illnesses in Pennsylvania, showing the effect of RAWMI Training:

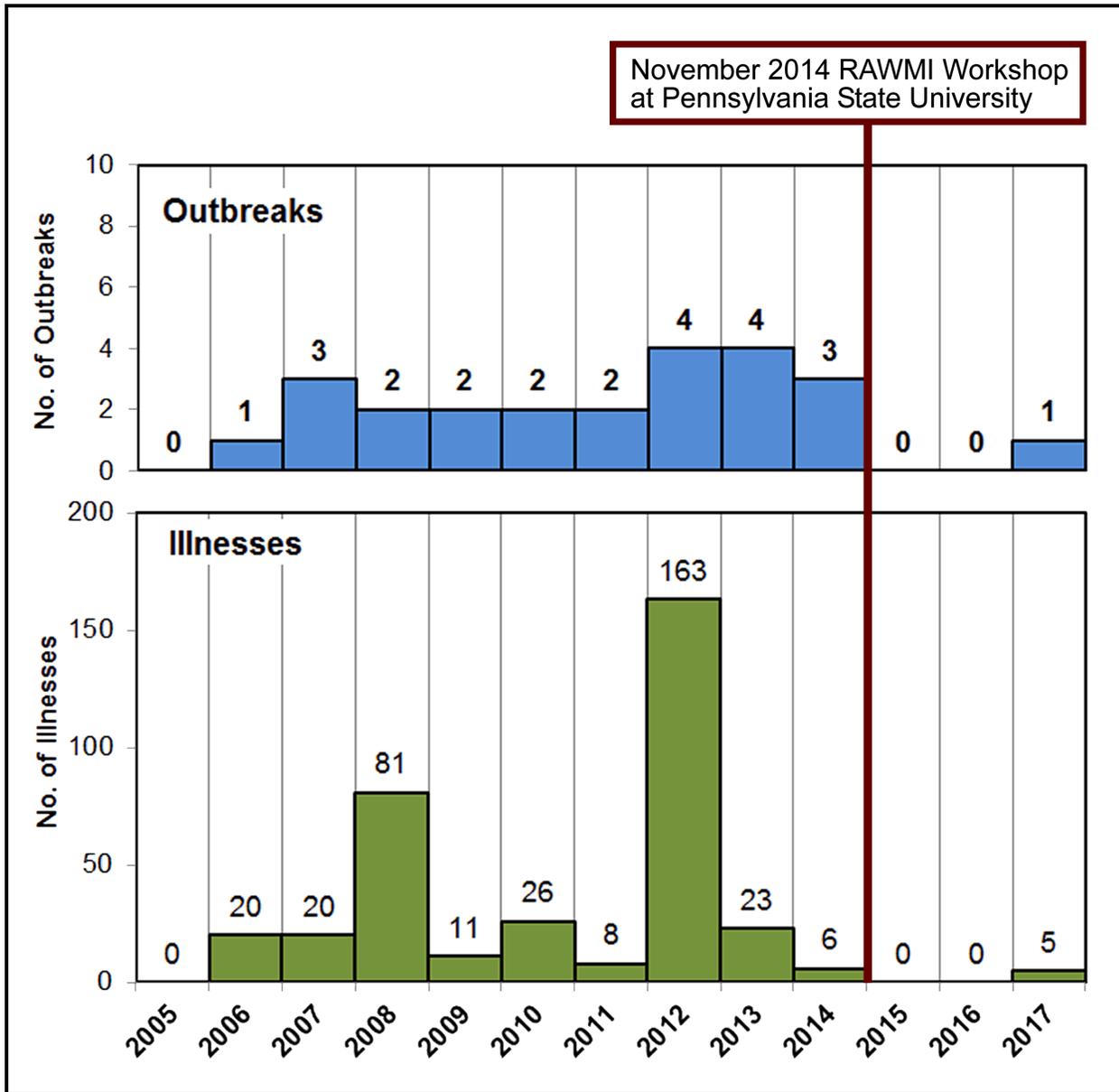


Figure 6: Annual number of outbreaks and illnesses related to unpasteurized fluid milk reported in Pennsylvania, 2006-2017. Data from the Foodborne Disease Outbreak Surveillance System, Centers for Disease Control and Prevention and Pennsylvania State Bureau of Epidemiology. [Note that then outbreak in 2017 (*Salmonella*, 5 illnesses, no hospitalizations, no deaths) was from an unlicensed farm.]