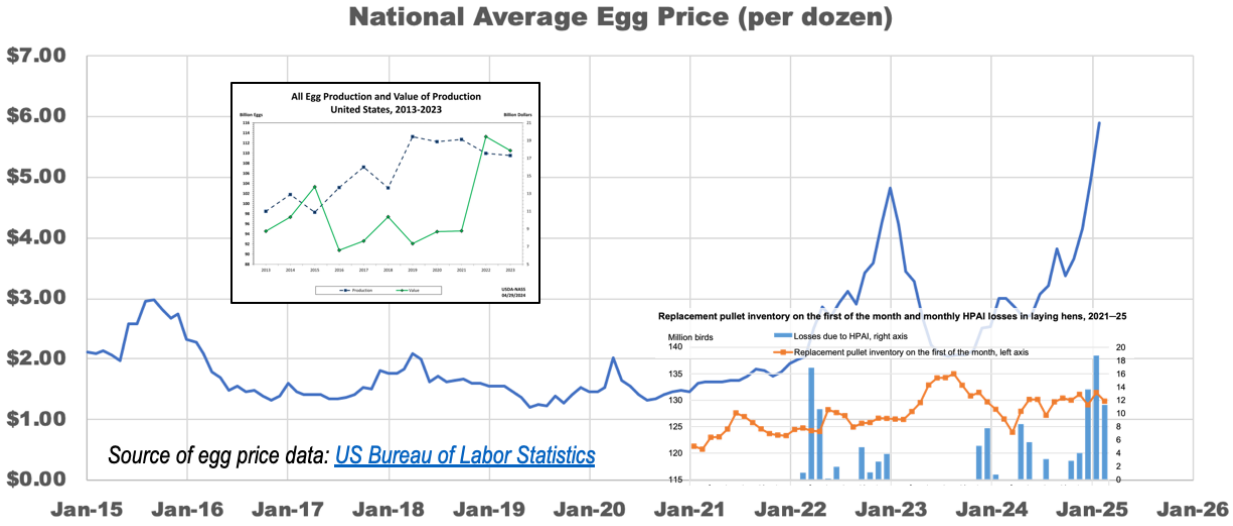
They are the Egg Men – I am the Modeler

Would limiting flock size confer resilience to US egg supply chains?

David I Gustafson, Ph.D., St. Louis, MO
March 19, 2025

I apologize to the generations of readers puzzled by the title, but as a life-long and very avid Beatles fan, John's bizarre 1967 composition quickly came to mind as I contemplated the topic of eggs. Of course, egg prices have been in the news, and this is the only agricultural topic that the new administration has thus far deemed worthy of new investment: up to $1B.

It is widely understood that recent spikes in egg prices are a direct consequence of successive outbreaks of highly pathogenic avian influenza (HPAI), which is known to infect both wild birds and domesticated flocks. Current USDA protocols require that entire flocks must be immediately killed (within 24 hours) if even a single case of HPAI is detected. As shown below, this has resulted in tens of millions of US egg-laying hens being killed in recent years.



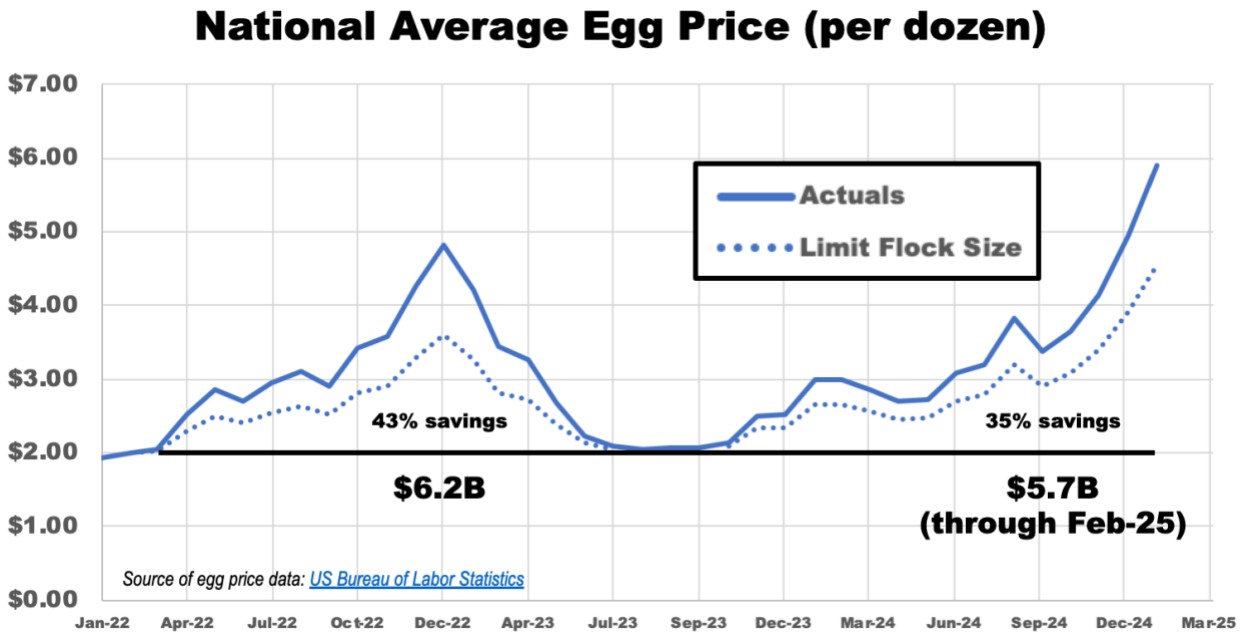
Examination of data available from CDC shows that more than 44 million egg-laying hens were killed in response to the 2022 outbreak (see table). More than 86 million have so far been killed since the current outbreak began. Although the total annual US-produced supply of eggs has remained near 110 billion per year, the two outbreaks have clearly resulted in major price shocks, the second of which could possibly have just peaked – although only time will tell.

	Reported Losses of Egg-Laying Hens	Losses with a Limit on Flock Size	Percent Reduction in Losses
Outbreak 1 (2022)	44,429,700 (37 flocks, 20 > 1M)	25,275,700	43%
Outbreak 2 (Nov-2023 to present)	86,092,100 (97 flocks, 34 > 1M)	56,201,300	35%

Data source: CDC

As indicated in this table, one simple approach that would apparently reduce losses would be to limit flock size. The numbers in this table are based on limiting flock size to 1 million. In this **extremely** simple approach to modeling the impact of such an intervention, I have neglected the likely impact of needing to add additional total flocks. I leave such more sophisticated modeling for the "egg heads" that will be hired using the $1B from USDA.

Nevertheless, if you'll allow me to proceed, I will make the further assumption that there is a simple linear relationship between price reductions and the reductions in total losses of egg-laying hens. We can then construct a very simple model for consumer egg prices, as shown below.



This simple model doesn't attempt to temporally allocate the resilience impact – it simply assumes the same percent reduction in the price spike (above $2 per dozen) is observed during each month of the outbreak-induced shock. The total savings estimate is derived by multiplying the price by the number of eggs sold, which has been assumed to be spread evenly by month (9.17B each month, out of the 110B per year). Using these simple assumptions, the net consumer savings as a result of this intervention over the course of the first outbreak would have been $6.2B. Savings for the current outbreak would have been $5.7B, and counting.

So, the simple analysis suggests that limiting flock size would indeed help confer resilience to US egg supply chains – although the actual savings would likely be a bit less, given the complications this simple analysis ignored. And I am sure there are other common sense actions that should be taken. After all, as we all know, we shouldn't put all our eggs into just one resilience basket!