Backyard to Plate: Assessing the Relationship Between Food Security and Backyard Animal Keeping

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Preliminary results, please do not cite without permission.

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Roadmap

1. Background & Motivation
2. Data & Methods
3. Results
4. Q&A
5. Appendix

2024 NAHMS[1] Study on Backyard Animal Keeping (BAK)

Overall study objectives:

1. Obtain national estimates of % of adults who own poultry, pigs, rabbits, and goats in urban and non-urban areas of the U.S.;
2. Describe animal management practices (e.g., veterinary care, biosecurity practices);
3. Describe any contact with live poultry and intention to own any one of the species of interest in the future;
4. Estimate the prevalence of animal ownership in Denver and Miami (surveyed in 2012), beliefs about ownership and changes;
5. Conduct a preliminary evaluation of the relationship between food security status and backyard animal keeping.

NAHMS Studies on Small-Scale Operations

Last Modified: February 29, 2024

NAHMS is planning a study on Backyard Animal Keeping that will take place in early to mid-2024. This study will produce national estimates on the percentage of households that keep poultry, goats, rabbits, and pigs.

Participants who keep any of these four species will be asked to answer questions on animal management and biosecurity practices. All participants will be asked to answer opinion questions related to backyard animal keeping as well as questions about intention to own any of the four species of interest in the future. Participants without poultry will be asked about any contact with live poultry.

A second survey will be conducted in Denver, CO, and Miami, FL, to estimate the percentage of households that keep chickens, pigs, rabbits, and goats. The survey will also examine participants' beliefs about chicken ownership and changes in those beliefs between 2012 and 2024.

In collaboration with Colorado State University, we will also explore the relationship between food security status and backyard animal keeping.

Participants will be contacted by the study team if selected for either survey. Participation is much appreciated. This study will help to improve our knowledge about backyard animal keeping and understanding of risks for foreign animal disease transmission. Results are anticipated in late 2024.

NAHMS also conducted a study focusing on small-scale operations in 2011.

See the complete list of all NAHMS studies and related materials ›

[1] National Animal Health Monitoring System

Pandemic Reconnect With Food

When Life Gives You Quarantine, Plant Potatoes

The pandemic separated my family from our neighbors. Could a network of backyard gardens bring us together?

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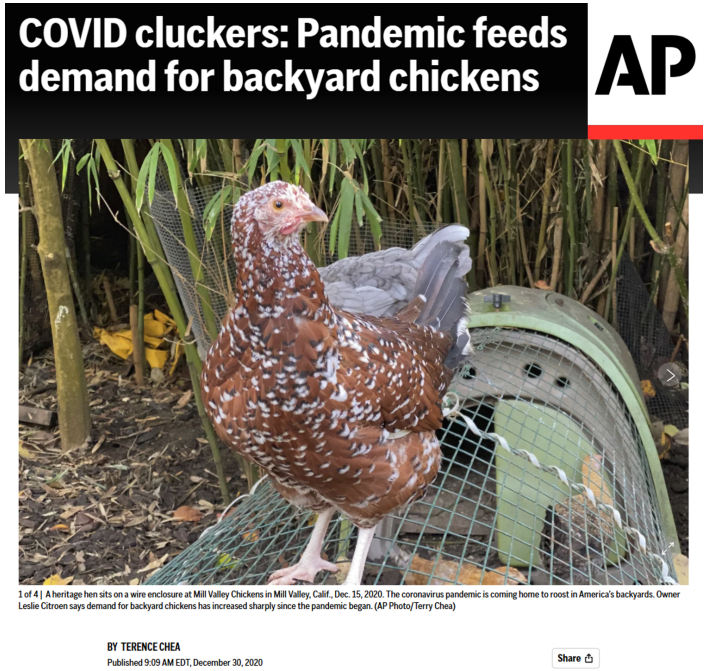
Joe Chivers, 10, planting young onions in one of the Ackroyds' new beds. C.J. Chivers

By C. J. Chivers



COVID cluckers: Pandemic feeds demand for backyard chickens AP

1 of 4 | A heritage hen sits on a wire enclosure at Mill Valley Chickens in Mill Valley, Calif., Dec. 15, 2020. The coronavirus pandemic is coming home to roost in America's backyards. Owner Leslie Citroen says demand for backyard chickens has increased sharply since the pandemic began. (AP Photo/Terry Chea)

BY TERENCE CHEA
Published 9:09 AM EDT, December 30, 2020

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- Documented increased interest in backyard gardening and animal keeping, especially during the pandemic, but limited evidence of the relationship to food security (Cattivelli, 2022; Coffin-Schmitt et al., 2023; Niles et al., 2021; Turnšek et al., 2022);
- No previous research looks at a nationally representative sample.

Research Question

What is the relationship between backyard animal keeping and food security?

Data

- 2024 Backyard Animal Keeping Study;
- 2023 Rural-Urban Continuum Codes;
- 2023 Feeding America Map the Meal Gap;
- 2016 Food Environment Atlas (Grocery Store Access).

Backyard Animal Keeping 2024 Study

- National study that used a survey panel and opt-in panel for data collection (May-June 2024);
  - 8,382 survey responses;
  - 1,467 answered food security questions (excludes "Don't Know");
  - 1,426-1,434 usable responses;
- Responses are weighted for population estimates;
- Results are preliminary and may slightly defer from those that will be released in the NAHMS report due to slight differences in data cleaning/validation.

Population Estimates

Backyard Animal Keeping by Species and BAK for Food

	Pct.	SE
Goats	1.3	0.2
Goats for Household Food	0.5	0.1
Pigs	1.4	0.3
Pigs for Household Food	0.4	0.1
Poultry	6.5	0.5
Poultry for Household Food	5.6	0.5
Rabbits	2.6	0.3
Rabbits for Household Food	0.4	0.1
Any of the four species (BAK)	10.0	0.7
BAK for Household Food	6.2	0.5

Food Security Population Estimates

Methods

- Utilize probit models to estimate the effects of backyard animal keeping on three measures of food security;
- Calculate (and report) marginal effects from these models;
  - Bootstrap standard errors;[2]
- Utilize Item Response Theory (IRT) to determine the effect of backyard animal keeping on food security holistically (in progress).

[2] Results presented used 100 iterations for computational speed/ease.

Survey Questions of Interest[3]

- In the last 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? (yes/no response)
- In the last 12 months, we couldn't afford to eat balanced meals. (scaled response, converted to yes/no)
- In the last 12 months, the food that we bought just didn't last, and we didn't have money to get more. (scaled response, converted to yes/no)

[3] "Don't Know" responses were coded as "NA"

Model

$$\Pr(Y_i = 1) = \Phi(Z_i)$$

$$Z_i = \beta_0 + \sum_{j=1}^{J} (\alpha_j \cdot \text{BAK}_{ij} + \gamma_j \cdot \text{FOOD}_{ij}) + \delta i \cdot C_i + \epsilon_i$$

- i Individual observation
- j Any of the Four Species (BAK), Goat, Pigs, Poultry, Rabbits
- Y_i Binary food security measure
- $\Phi(Z_i)$ Probit link (standard normal CDF)
- BAK_{ij} 1 if owns species j, 0 if not
- FOOD_{ij} 1 if owns species j for household food consumption, 0 if not
- C_i Vector of individual controls: grocery store access, age, sex, unemployed, income, household size, race/ethnicity, and RUCC
- ϵ_i Unexplained variation

We had to cut the size or skip meals because there wasn't enough money for food.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
BAK	−0.021		−0.076*				
	(0.033)		(0.043)				
BAK for Household Food		0.007	0.080*				
		(0.034)	(0.048)				
Has Goats				0.008			
				(0.105)			
Goats for Household Food				−0.039			
				(0.115)			
Has Pigs				0.020			
				(0.102)			
Pigs for Household Food				0.041			
				(0.189)			
Has Poultry				−0.033	−0.033	−0.042	
				(0.078)	(0.070)	(0.076)	
Poultry for Household Food				0.006	0.008	0.025	
				(0.077)	(0.074)	(0.074)	
Has Rabbits				−0.093**	−0.094*		−0.098**
				(0.044)	(0.049)		(0.047)
Rabbits for Household Food				0.284**	0.292***		0.287**
				(0.136)	(0.104)		(0.124)
RMSE	0.36	0.36	0.36	0.35	0.35	0.36	0.35
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
nobs	1,434	1,434	1,434	1,434	1,434	1,434	1,434

* p <0.1, ** p <0.05, *** p <0.01
Controls: grocery store access, age, sex, unemployed, income, household size, race/ethnicity, and RUCC

Key Takeaways

- Backyard animal keeping is most associated with cutting or skipping meals;
  - Keeping any BAK $\Rightarrow$ less likely to report cutting/skipping meals;
  - Keeping any BAK for household food $\Rightarrow$ more likely to report cutting/skipping meals;
  - Rabbits are only species with statistically significant marginal effects;
- Backyard animal keeping has little association with the other measures;
  - Mostly the same signs as cutting/skipping meals, no statistically significant species marginal effects.

⏩ Results: Couldn't afford to eat balanced meals

⏩ Results: Food didn't last and not enough money to get more

Next Steps

- Utilize Item Response Theory (IRT) to map the responses of all three questions to one measure of food security/insecurity;
- Add interaction terms for robustness checks such as income $\times$ BAK;
- Increase bootstrap iterations for better marginal effect standard errors.

Thank you! Questions?

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Population Estimates

We had to cut the size or skip meals because there wasn't enough money for food.

	BAK		Non-BAK		Total	
	Pct.	SE	Pct.	SE	Pct.	SE
Yes	25.5	2.2	20.8	2.0	21.3	1.8
No	69.7	2.3	75.0	2.2	74.5	2.0
Don't Know	4.8	1.2	4.1	1.1	4.2	1.0

◂ BAK Population Estimates

Population Estimates

We couldn't afford to eat balanced meals.

	BAK		Non-BAK		Total	
	Pct.	SE	Pct.	SE	Pct.	SE
Often true	11.5	1.6	8.7	1.4	9.0	1.3
Sometimes true	26.3	2.2	24.1	2.0	24.3	1.9
Never true	57.3	2.4	64.9	2.3	64.2	2.1
Don't know	4.9	1.2	2.3	0.9	2.5	0.8

◂ BAK Population Estimates

Population Estimates

The food that we bought just didn't last, and we didn't have money to get more.

	BAK		Non-BAK		Total	
	Pct.	SE	Pct.	SE	Pct.	SE
Often true	12.3	1.8	7.6	1.4	8.0	1.2
Sometimes true	23.1	2.0	22.9	2.0	22.9	1.8
Never true	58.9	2.4	66.3	2.2	65.6	2.0
Don't know	5.7	1.3	3.3	1.0	3.5	0.9

◂ BAK Population Estimates

We couldn't afford to eat balanced meals.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
BAK	−0.021		−0.014				
	(0.035)		(0.053)				
BAK for Household Food		0.007	0.017				
		(0.038)	(0.054)				
Has Goats				0.106			
				(0.080)			
Goats for Household Food				−0.146			
				(0.146)			
Has Pigs				−0.072			
				(0.105)			
Pigs for Household Food				0.067			
				(0.168)			
Has Poultry				−0.001	−0.002	−0.006	
				(0.100)	(0.106)	(0.110)	
Poultry for Household Food				−0.008	−0.009	−0.005	
				(0.099)	(0.106)	(0.116)	
Has Rabbits				−0.048	−0.047		−0.048
				(0.047)	(0.049)		(0.057)
Rabbits for Household Food				0.113	0.094		0.090
				(0.146)	(0.163)		(0.150)
RMSE	0.36	0.36	0.41	0.41	0.41	0.41	0.41
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
nobs	1,434	1,434	1,434	1,434	1,434	1,434	1,434

* p <0.1, ** p <0.05, *** p <0.01
Controls: grocery store access, age, sex, unemployed, income, household size, race/ethnicity, and RUCC

◂ Key Takeaways

The food that we bought just didn't last, and we didn't have money to get more.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
BAK	0.016		0.038				
	(0.030)		(0.044)				
BAK for Household Food		0.003	−0.034				
		(0.044)	(0.051)				
Has Goats				−0.053			
				(0.090)			
Goats for Household Food				0.120			
				(0.127)			
Has Pigs				0.134			
				(0.110)			
Pigs for Household Food				−0.116			
				(0.173)			
Has Poultry				0.011	0.013	0.012	
				(0.090)	(0.090)	(0.085)	
Poultry for Household Food				−0.058	−0.046	−0.042	
				(0.093)	(0.086)	(0.090)	
Has Rabbits				−0.013	−0.008		−0.010
				(0.054)	(0.051)		(0.053)
Rabbits for Household Food				0.108	0.142		0.133
				(0.159)	(0.145)		(0.141)
RMSE	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
nobs	1,426	1,426	1,426	1,426	1,426	1,426	1,426

* p <0.1, ** p <0.05, *** p <0.01
Controls: grocery store access, age, sex, unemployed, income, household size, race/ethnicity, and RUCC

◂ Key Takeaways