



# Food Insecurity in the United States of America

By A. Nicole Mosley, Ivette Sierra, & Natalin Williams





## **MEET “THE FAB 3” DATA SCIENTISTS**

# A. Nicole Mosley

- Bachelors in Political Science (International Relations), Minor in Economics
- Previously employed by U.S. Census Bureau, logistics companies; interned with D.C. Executive Office of the Mayor
- Experience in human resources, research, administrative and program support, international travel
- Looking to apply Data Science expertise to political consulting



# Ivette Sierra

- Graduated from John Jay College of Criminal Justice with a Bachelor of Science Degree in Criminal Justice
- 10 years experience as a Law Enforcement Officer with the NYC Parks Dept., NYPD School Safety Agent, & in the private sector as a Public Safety Officer with the Hunt's Point Produce Terminal Market.
- Looking to obtain a position as a Data Scientist in the Criminal Justice field or in Public Administration.



# Natalin Williams

- 20 years in retail, compounding, and hospital pharmacy settings as a certified pharmacy technician, manager, and inventory specialist
- 10 years as business owner of wellness company and photography company
- Former interior designer and project manager of a Birmingham metro construction company
- Volunteer for local children's outreach programs
- Data science is the perfect fit for my love for research, design creativity, management skills, and local outreach programs



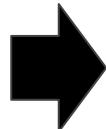
# Why Care About Food Insecurity?

# When The News Headlines Become All Too Real



## Our Backgrounds

- Pharmacy
- Logistics
- Politics



## Our Observations

- Noticing increased prices of everyday expenses, particularly food/groceries, gasoline, and utilities
- Witnessing lack of food/resources in lives of our friends, neighbors, fellow citizens

# Uncovering Food Insecurity



# What is Food Insecurity?



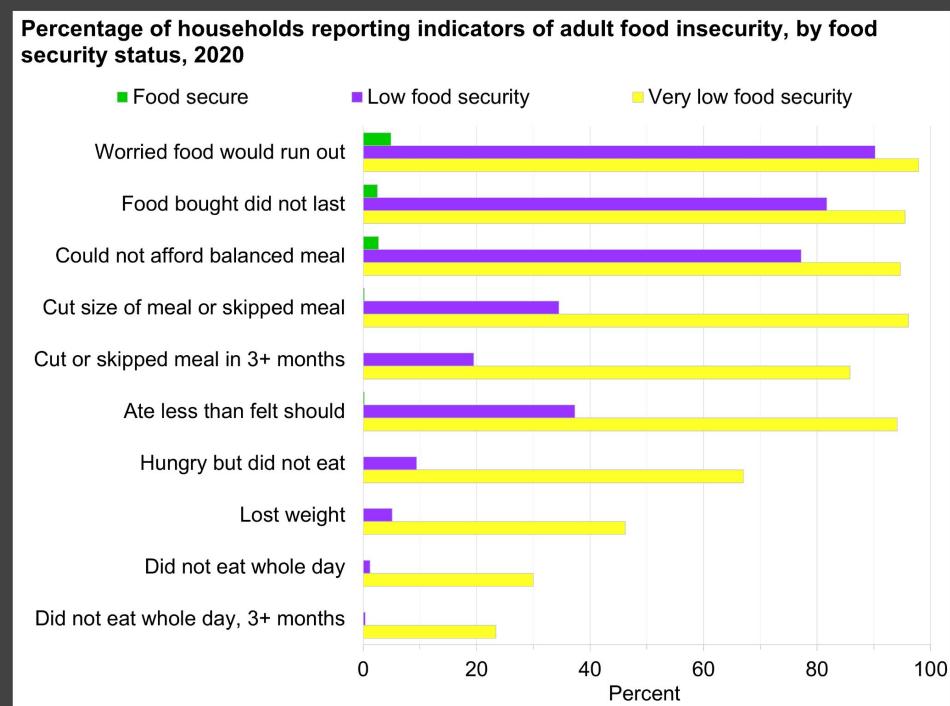
- Lack of consistent access to enough food for every person in a household to live an active, healthy life
- Can be a temporary situation for a household or can last a long time
- Indicator to measure how many people cannot afford food
- Feeding America: As many as **42 million Americans (1 in 8), including 13 million children (1 in 6)**, may have experienced food insecurity in 2021

Food security status  
lies along a continuum

(based on the number of affirmative responses  
to the food security module questions)



# 2020 U.S. Census Food Security Survey



Source: USDA, Economic Research Service, using data from the December 2020 Current Population Survey Food Security Supplement, U.S. Census Bureau.

Feeding America, 2022

# What Are the Causes and Effects of Food Insecurity?



- Poverty, unemployment, low income
- Not enough affordable housing
- Chronic illness, serious health conditions/complications, or gaps in access to healthcare
- Systemic racism and racial discrimination
- Delayed child development
- Having to prioritize financial obligations: rent or food?

# Approach/Methods



# Week One : Project Planning

Choosing a specific topic?



- Brainstorming
- Dataset “Scavenger Hunt”
  - Food insecurity
  - Child food insecurity
  - Population below poverty
- Regional Price Parities
- Unemployment
- Inflation
- Locate all relevant research



# Week Two : Data Wrangling

How was data cleaned and prepared for analysis?

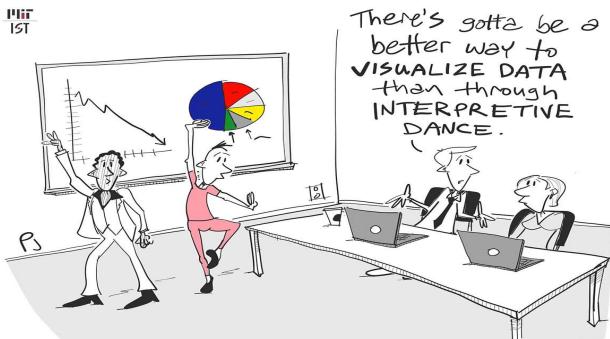


## Python, RStudio

- Removed missing data and all NaN values
- Trimmed datasets
- Subsetted and categorized data for easier manipulation and analysis
- Altered data types from/to float, string, factor, integer, numeric, category
- Recoded data categories as needed



# Weeks Three-Four-Five Exploratory, Data Analysis, and Data Visualization



How was the data best interpreted?

## Python, RStudio

- Correlation Matrices
- Correlation Heat Maps
- Histograms
- Boxplots
- Bar Graphs
- Scatterplots
- Linear Regression

## Tableau

- Bar Charts
- Line Graphs
- Geographic Graphs

## Excel

- Dependent t-Test
- Line and Bar Charts

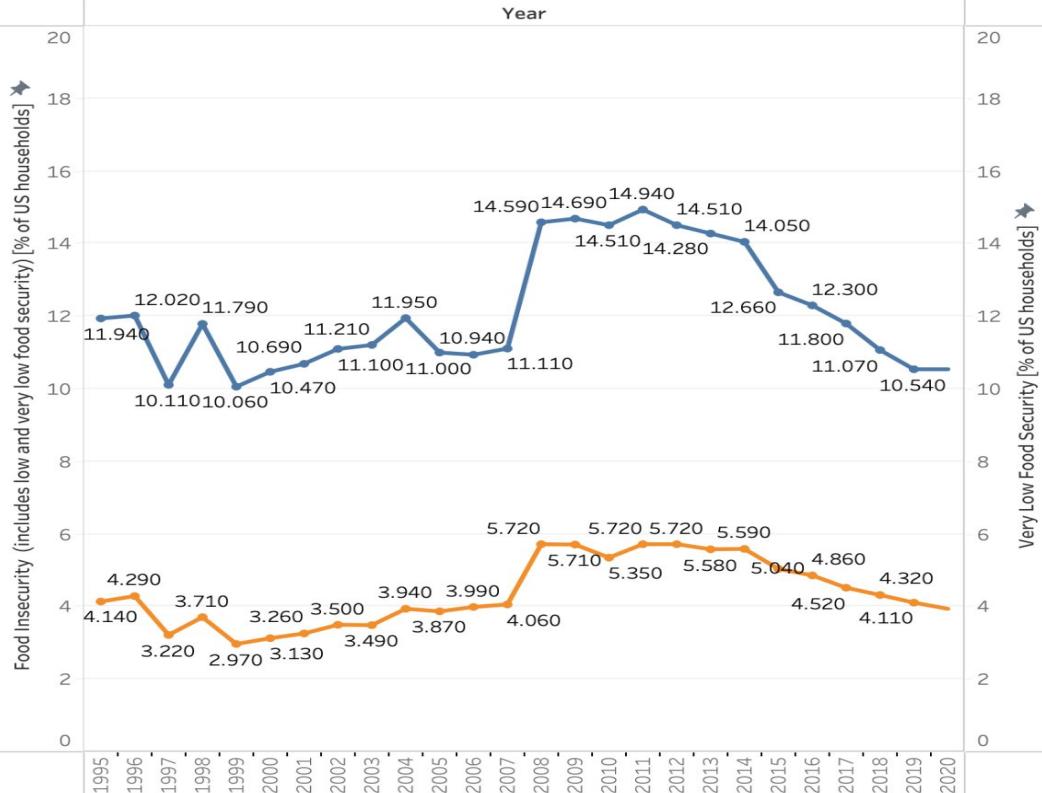


# Dynamics of Food Insecurity

- Primary Causes: poverty, unemployment, underemployment, geography (affecting access to whole/nutritious food), food prices, inflation - makes phenomenon difficult to solve
- On national level, monitored by agencies such as:
  - U.S. Department of Agriculture - Economic Research Service (**USDA-ERS**)
  - Feeding America
  - U.S. Census Bureau
- Other agencies with supporting statistics:
  - Bureau of Economic Analysis (**BEA**)
  - Bureau of Labor Statistics (**BLS**)

# **Results - Food Insecurity Trends**

## Trends in Prevalence Rates of Food Insecurity and Very Low Food Security in U.S. Households, 1995-2020 (USDA)



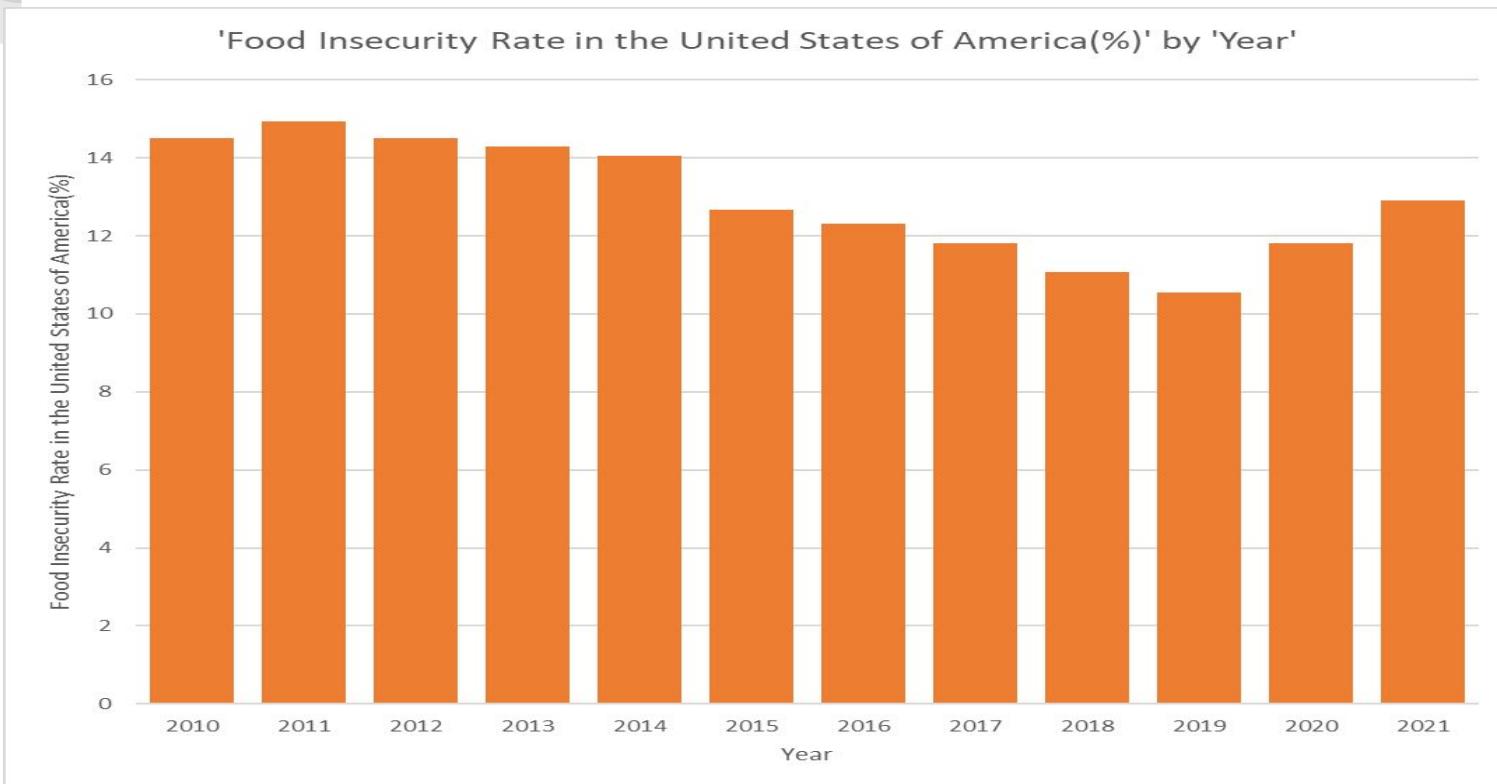
The trends of Food insecurity (includes low and very low food security) - % of US households and Very low food security- % of US households for Year Year. Color shows details about Food insecurity (includes low and very low food security) - % of US households and Very low food security- % of US households. The view is filtered on Year Year, which excludes Null.

**Measure Names**

- Food insecurity (includes low and very low food security) - % of US households
- Very low food security- % of US households

- Before the start of the pandemic, the overall food insecurity rate had reached its lowest point since it began to be measured in the 1990s, but...
- Covid-19 threatened to upend progress
- Although more recent reports indicate that food security appears to be steadily increasing, will added pressures threaten this?

# Food Insecurity Actual(%) Years 2010-2020 and 2021(Projected %)





# Timeline

## Great Recession (2007-2009)

- Dec. 2007-June 2009: Economic downturn after bursting of housing bubble and global financial crisis
- Food insecurity levels grew **beyond** poverty rate; traditionally closely tied
- Inflation rate range: -0.4 -3.8%

2019

2007

## Big Changes in Trucking Industry

- Trucker population went from 7.65 million to 3.36 million, a decrease of 6.8% from 2019
- April 2020: unemployment at all-time high of 14.8% since 1948; labor force participation rate fell to 60.2%
- Partial recovery in May 2020  
Inflation rate: 1.23%

2021

2020

## Global Upheaval

- Current war in Ukraine threatens global food crisis, crucial portion of the world's **wheat**, corn, barley, fertilizer trapped in region, leading to rising prices
- **Following CV-19, inflation rate has reached 7%, highest in decades**
- Natural Disasters

2022

## Onset of Covid-19 Pandemic and Recession

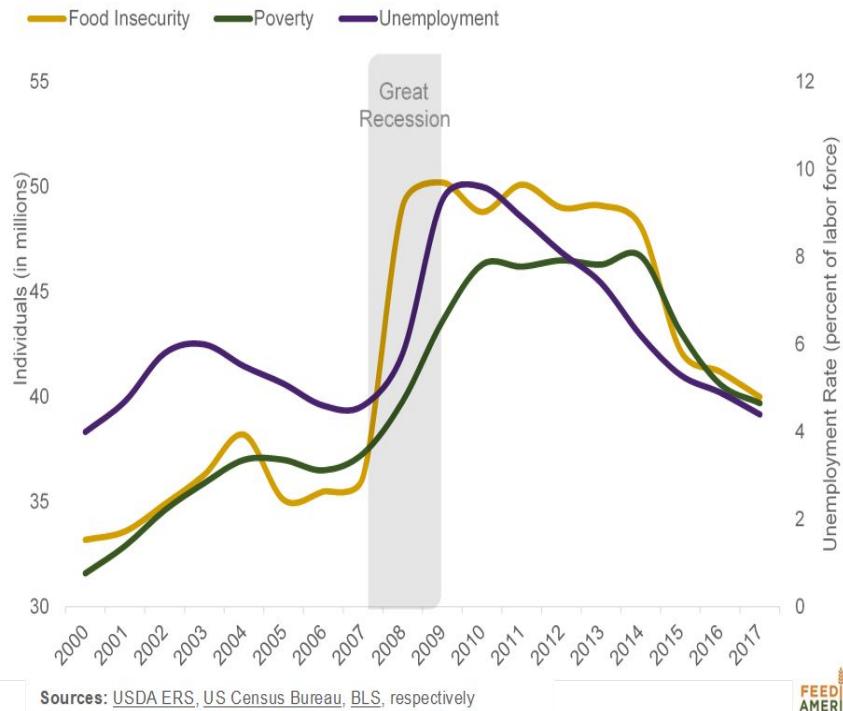
- Feb 2020: Although national food insecurity rate was lowest in 20 years (10.54%), the pandemic has presented another significant setback
- Between 2018-2019, total U.S. agricultural exports fell in value from 144.7 billion to 141.2 billion, decrease of 2.4%; and from 219.7 million metric tons to 199.5 million metric tons (loss of 9.2%)
- Inflation rate of 1.81%

## Recovery or Not?: The Big Standstill

- March 2021: Ever Given Shipping Container Blockage, Computer Chip Factory Fire
- July 2021: Labor force participation rate at 61.7%
- July 2021: Unemployment remained higher (5.4%) than it had been in Feb 2020 (3.5%)
- Inflation rate: 4.7%

# Hunger, Poverty, and Unemployment

## Food Insecurity, Poverty, and Unemployment, 2000-2017



In 2019, the overall food insecurity rate was the lowest it had been in more than twenty years.

- 1 in 9 individuals (10.9%) and 1 in 7 children (14.6%) lived in a food-insecure household.

Yet, more than 35 million people overall, including nearly 11 million children, were food insecure.

Two factors that influence food insecurity rates include unemployment and poverty, which were both at recent lows heading into the pandemic.

- The overall unemployment rate was 3.7% at the end of 2019 and the overall poverty rate was 10.5%.

However, underlying these national figures, significant disparities existed.<sup>2</sup>



1 in 12 white, non-Hispanic individuals (8.1%) lived in a food-insecure household,

Compared to:



1 in 6 Latino individuals (15.8%)

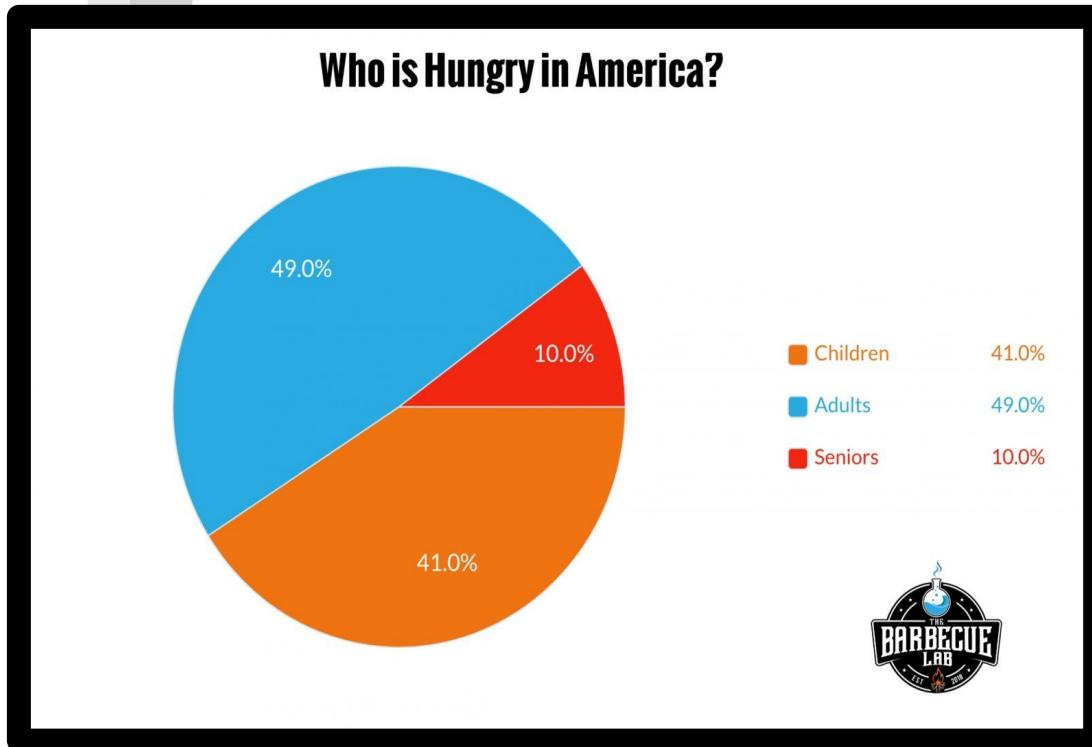


1 in 5 Black, non-Hispanic individuals (19.3%)



1 in 4 Native American individuals (23.5%)

# Who is Hungry in America in 2021/2022?



- The Barbecue Lab: Of 330 million Americans, approximately 41 million people total (12% of population) struggle with hunger
  - 20 million adults
  - 16 million children
  - 4.1 million seniors
- Feeding America projections slightly unchanged btwn 2019 and 2021
  - 1 in 5 Black individuals (19.3% to 21.3%)
  - 1 in 10 to 1 in 9 white individuals (9.6% to 11.1%)

**National projections of food insecurity by select characteristics for 2020 and 2021**  
As compared to 2019 actuals

	Actuals	Projections	
	2019	2020	2021
<b>INDICATORS/ASSUMPTIONS<sup>7</sup></b>			
Annual Unemployment Rate	3.7%	9.2%	6.7%
Annual Poverty Rate	10.5%	11.1%	12.0%
Annual Child Poverty Rate	14.4%	14.8%	16.0%
<b>FOOD INSECURITY PROJECTIONS</b>			
<b>OVERALL POPULATION</b>			
Food Insecurity			
Annual Food Insecurity Rate	10.9%	13.9%	12.9%
Number of Food-insecure People	35.2 million	45 million	42 million
Ratio	1 in 9	1 in 7	1 in 8
Very low food security (VLFS) [a subset within food insecurity]			
Annual VLFS Rate	3.7%	5.1%	4.6%
Number of people experiencing VLFS	11.8 million	17 million	15 million
Ratio	1 in 27	1 in 20	1 in 22
<b>CHILD POPULATION</b>			
Food Insecurity			
Annual Food Insecurity Rate	14.6%	19.9%	17.9%
Number of Food-insecure People	10.7 million	15 million	13 million
Ratio	1 in 7	1 in 5	1 in 6
Very low food security (VLFS) [a subset within food insecurity]			
Annual VLFS Rate	3.9%	5.7%	5.1%
Number of people experiencing VLFS	2.9 million	4.2 million	3.7 million
Ratio	1 in 26	1 in 18	1 in 20
<b>BY RACE</b>			
Food Insecurity – Black Individuals			
Annual Food Insecurity Rate	19.3%	21.6%	21.3%
Number of Food-insecure People	9.0 million	10 million	10 million
Ratio	1 in 5	1 in 5	1 in 5
Food Insecurity – white Individuals			
Annual Food Insecurity Rate	9.6%	12.3%	11.1%
Number of Food-insecure People	23.6 million	31 million	28 million
Ratio	1 in 10	1 in 8	1 in 9
<b>BY GEOGRAPHY</b>			
Food Insecurity – Individuals in Rural Counties			
Annual Food Insecurity Rate	12.5%	14.4%	13.3%
Number of Food-insecure People	5.4 million	6 million	6 million
Ratio	1 in 8	1 in 7	1 in 8
Food Insecurity – Individuals in Urban Counties			
Annual Food Insecurity Rate	10.6%	13.1%	12.1%
Number of Food-insecure People	29.8 million	37 million	34 million
Ratio	1 in 9	1 in 8	1 in 8

	2019	2020	2021
<b>FI rate (individual not household)</b>	<b>10.9%</b>	Projected: <b>13.9%</b> Actual: <b>11.8%</b>	Projected: <b>12.9%</b> Estimated Actual (by The BBQ Lab): <b>12%</b>
<b># of FI people (overall pop)</b>	<b>35.2 million</b>	Projected: <b>45 million</b> Actual: <b>&gt; 38 million</b>	Projected: <b>42 million</b> Estimated Actual (by The BBQ Lab): <b>41 million</b>
<b># of FI people (child pop)</b>	<b>10.7 million</b>	Projected: 15 million Actual: <b>11.7 million</b>	Projected: <b>13 million</b> Estimated Actual (by The BBQ Lab): <b>16 million</b>

# Stats on Children Experiencing Hunger

**23.8%** of children live  
below the poverty line

**22 Million**  
children rely on the **free or  
reduced price** lunch meals  
from school for food

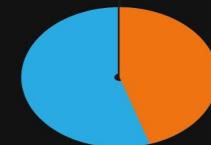
## Hunger in American Children

**6 out of 7**

hungry children eat less during  
the summer because they're no  
longer getting school lunches



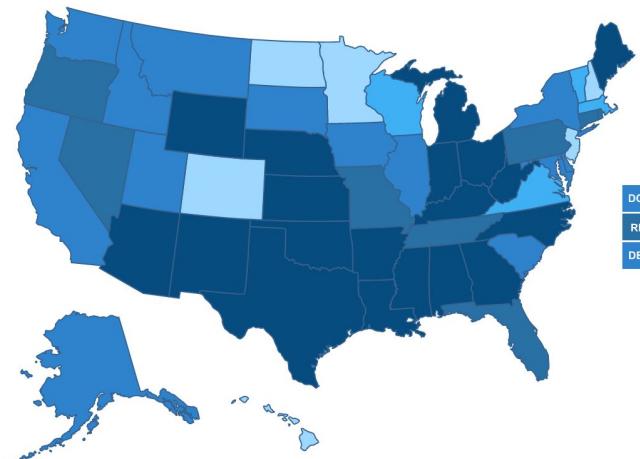
**45% of food  
stamp users  
are children**



# Thematic Map: Food Insecurity

2019

Percentage of households unable to provide adequate food for one or more household members due to lack of resources



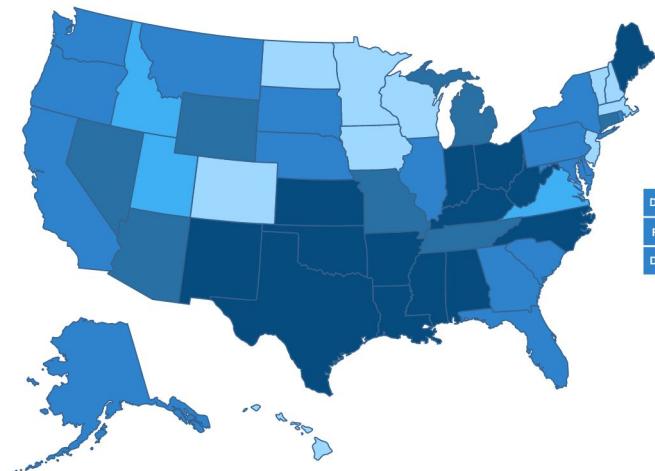
<= 9.6%    9.7% - 10.2%    10.3% - 11.7%    11.8% - 12.9%    >= 13.0%

## Source:

- U.S. Department of Agriculture, Household Food Security in the United States Report

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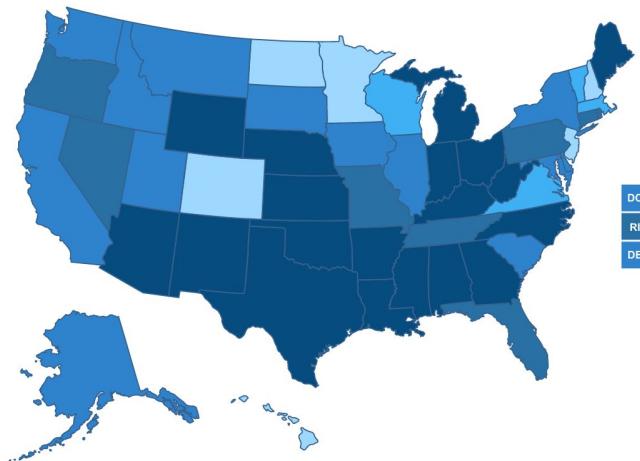
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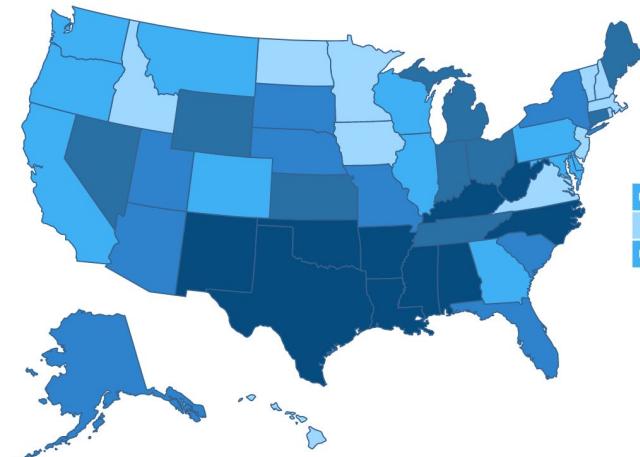
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# Top Five States For Food Insecurity and Unemployment

2019	2020	2021
New Mexico - 17.9%	New Mexico - 16.8%	Mississippi - 15.7%
Arkansas - 17.4%	Mississippi - 15.9%	West Virginia - 15.4%
Louisiana - 17.3%	Louisiana - 15.8%	Louisiana - 15.3%
Mississippi - 17.2 %	West Virginia - 15.7%	New Mexico - 15.1%
Alabama - 16.3%	Oklahoma - 15.6%	Oklahoma - 14.7%

	2018			2019			2020			2021		
Highest Unemployment	State 2018			State 2019			State 2020			State 2021		
	1	Alaska	6.5	1	Alaska	6.1	28	Nevada	13.5	4	California	7.3
	8	D.C.	5.7	8	D.C.	5.5	11	Hawaii	12.0	28	Nevada	7.2
	48	West Virginia	5.2	24	Mississippi	5.4	4	California	10.2	32	New York	6.9
	18	Louisiana	4.9	31	New Mexico	4.9	22	Michigan	10.0	31	New Mexico	6.8
	31	New Mexico	4.9	48	West Virginia	4.9	32	New York	9.9	8	D.C.	6.6

# Top Five States For Food Insecurity and Poverty

2019	2020	2021
New Mexico - 17.9%	New Mexico - 16.8%	Mississippi - 15.7%
Arkansas - 17.4%	Mississippi - 15.9%	West Virginia - 15.4%
Louisiana - 17.3%	Louisiana - 15.8%	Louisiana - 15.3%
Mississippi - 17.2 %	West Virginia - 15.7%	New Mexico - 15.1%
Alabama - 16.3%	Oklahoma - 15.6%	Oklahoma - 14.7%

## States With Highest Poverty Rates (2016-2020)

Mississippi - 19.58%	West Virginia - 15.7%
Louisiana - 18.65%	Kentucky - 16.61%
New Mexico - 18.65%	Arkansas - 16.08%

# Cost of Living - Regional Price Parities (RPPs)

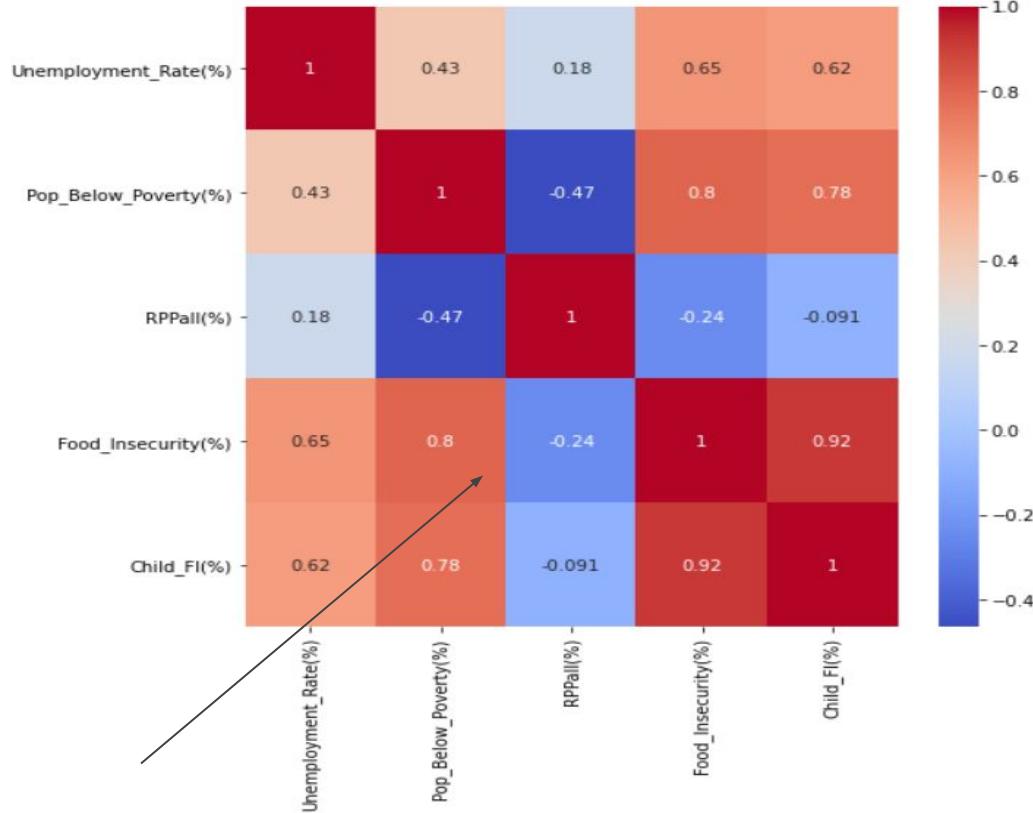
HIGHEST	2018	2019	2020	2021																																				
All Items	<table border="1"> <thead> <tr> <th>State</th><th>2018</th></tr> </thead> <tbody> <tr><td>9 District of Columbia</td><td>110.912</td></tr> <tr><td>8 New Jersey</td><td>110.832</td></tr> <tr><td>44 California</td><td>110.755</td></tr> <tr><td>40 Hawaii</td><td>110.022</td></tr> <tr><td>5 New York</td><td>109.346</td></tr> </tbody> </table>	State	2018	9 District of Columbia	110.912	8 New Jersey	110.832	44 California	110.755	40 Hawaii	110.022	5 New York	109.346	<table border="1"> <thead> <tr> <th>State</th><th>2019</th></tr> </thead> <tbody> <tr><td>40 Hawaii</td><td>111.333</td></tr> <tr><td>8 New Jersey</td><td>110.878</td></tr> <tr><td>44 California</td><td>109.877</td></tr> <tr><td>5 New York</td><td>109.463</td></tr> <tr><td>9 District of Columbia</td><td>109.060</td></tr> </tbody> </table>	State	2019	40 Hawaii	111.333	8 New Jersey	110.878	44 California	109.877	5 New York	109.463	9 District of Columbia	109.060	<table border="1"> <thead> <tr> <th>State</th><th>2020</th></tr> </thead> <tbody> <tr><td>40 Hawaii</td><td>111.985</td></tr> <tr><td>9 District of Columbia</td><td>111.459</td></tr> <tr><td>8 New Jersey</td><td>111.163</td></tr> <tr><td>44 California</td><td>110.380</td></tr> <tr><td>5 New York</td><td>110.212</td></tr> </tbody> </table>	State	2020	40 Hawaii	111.985	9 District of Columbia	111.459	8 New Jersey	111.163	44 California	110.380	5 New York	110.212	N/A
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# Cost of Living - Regional Price Parities (RPPs)

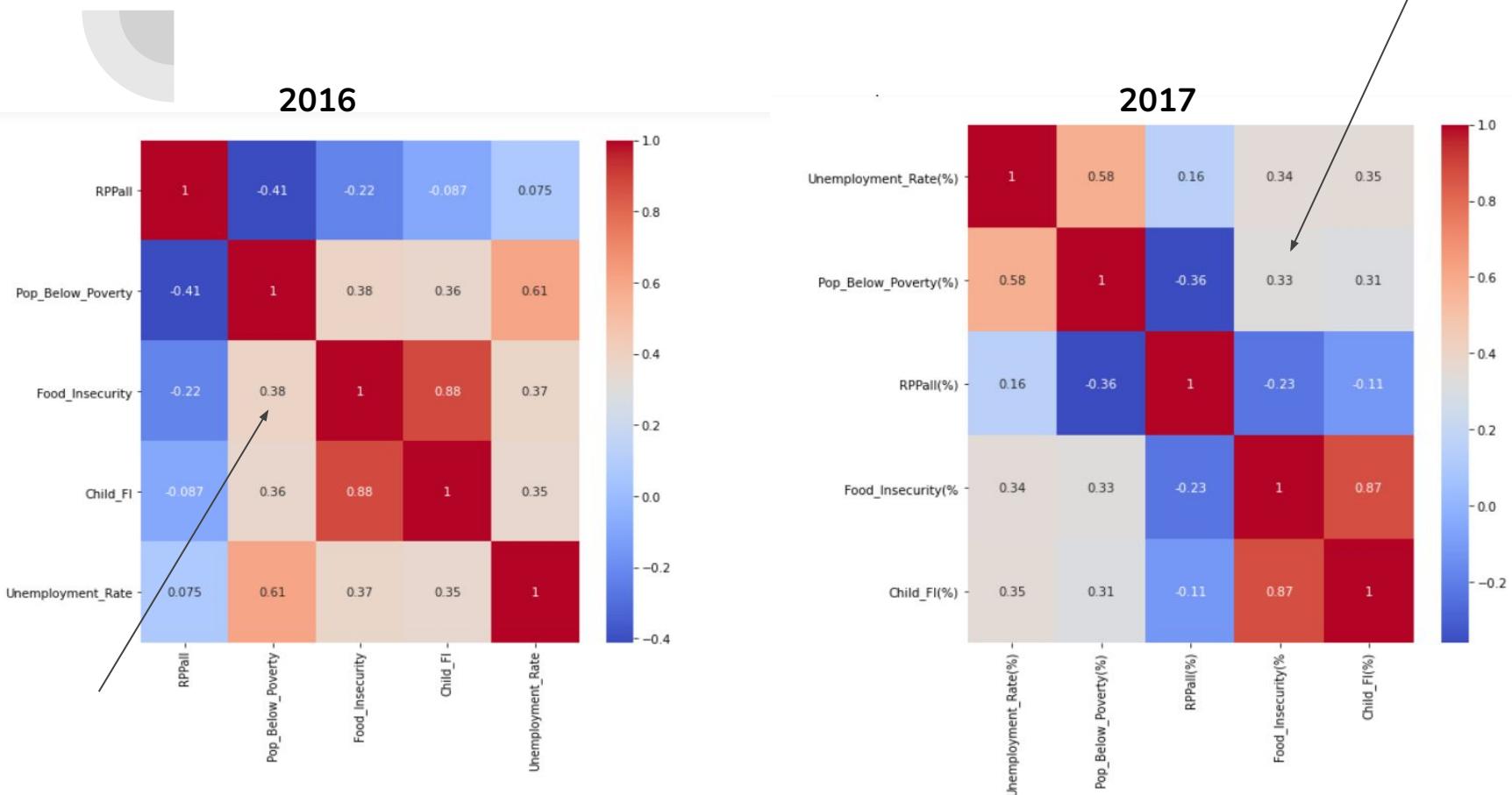
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# Correlation Heat Maps

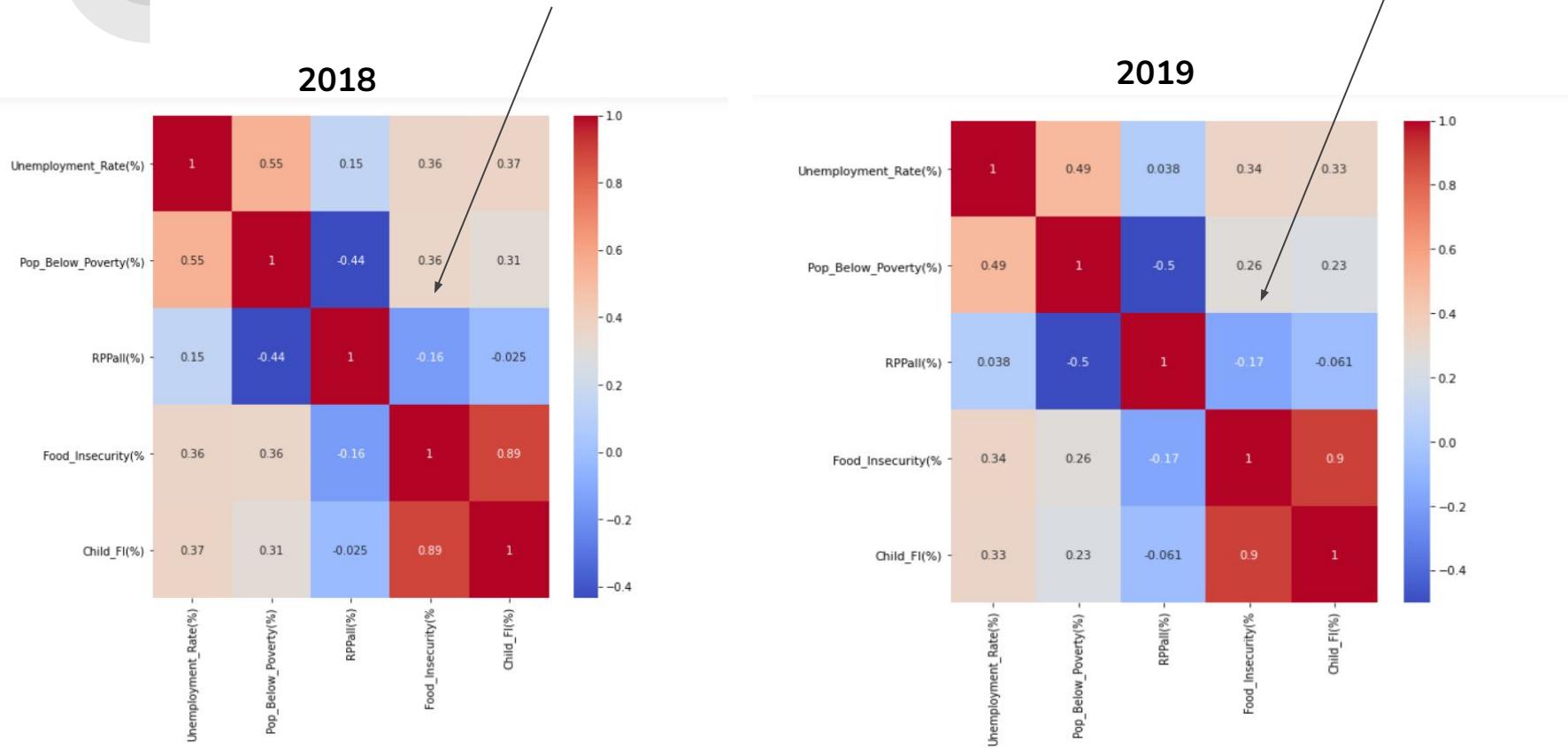
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# Correlation Heat Maps



# Correlation Heat Maps





# Understanding the Market: What Other Outside Factors Affect Food Insecurity?

# Unemployment Trends

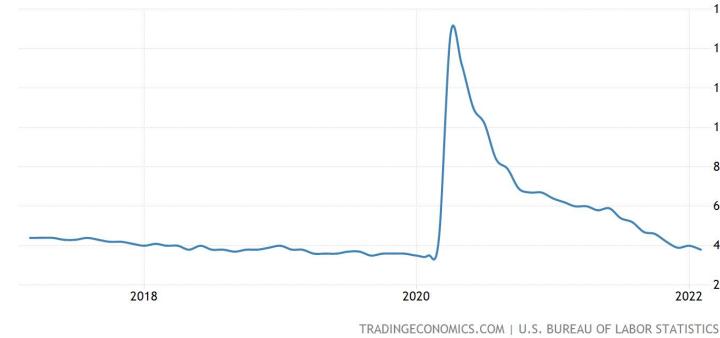
TRADING ECONOMICS | U.S. BLS - UNEMPLOYMENT

25Y

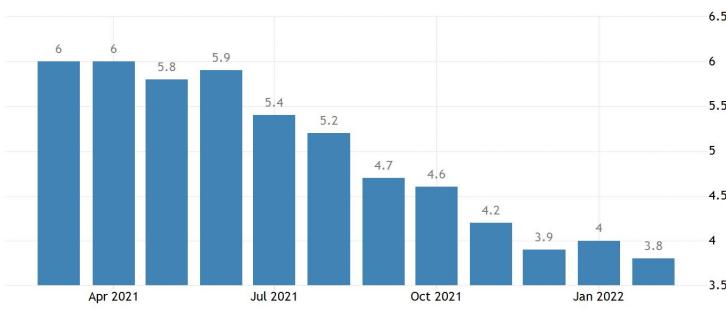


5Y

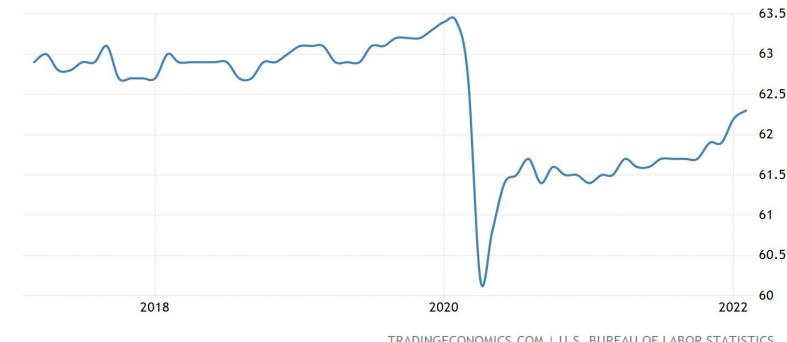
\* ALL RATES EXPRESSED AS A PERCENTAGE



1Y

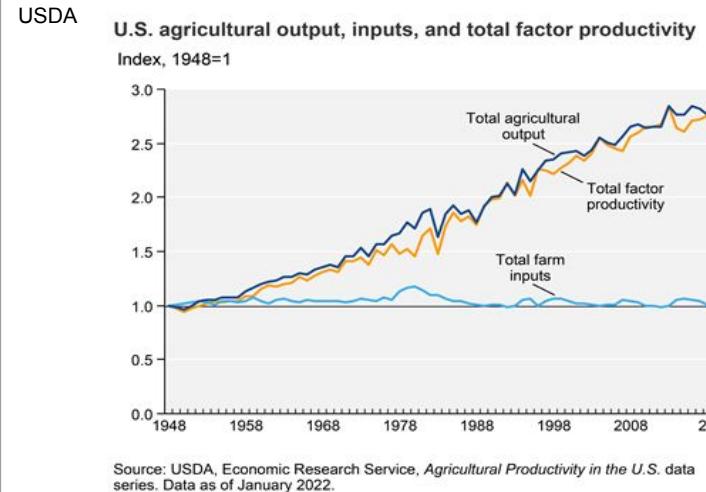
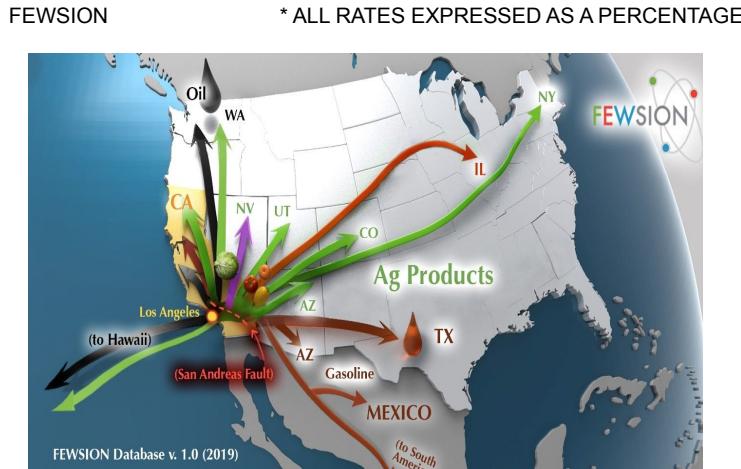


5Y - LABOR FORCE PARTICIPATION

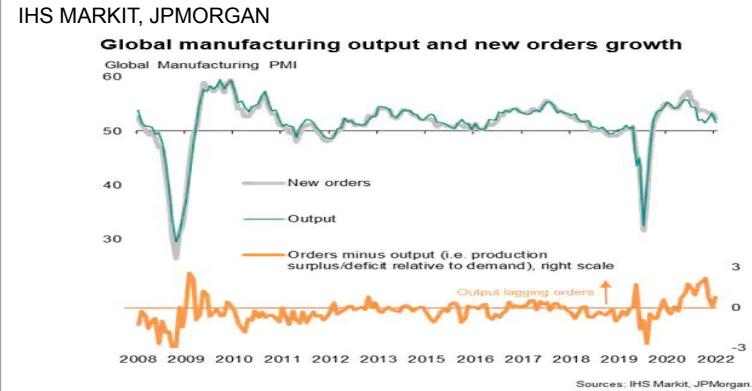


# Other Relevant Trends

## Agricultural Production



## Manufacturing



# Global Agricultural Production

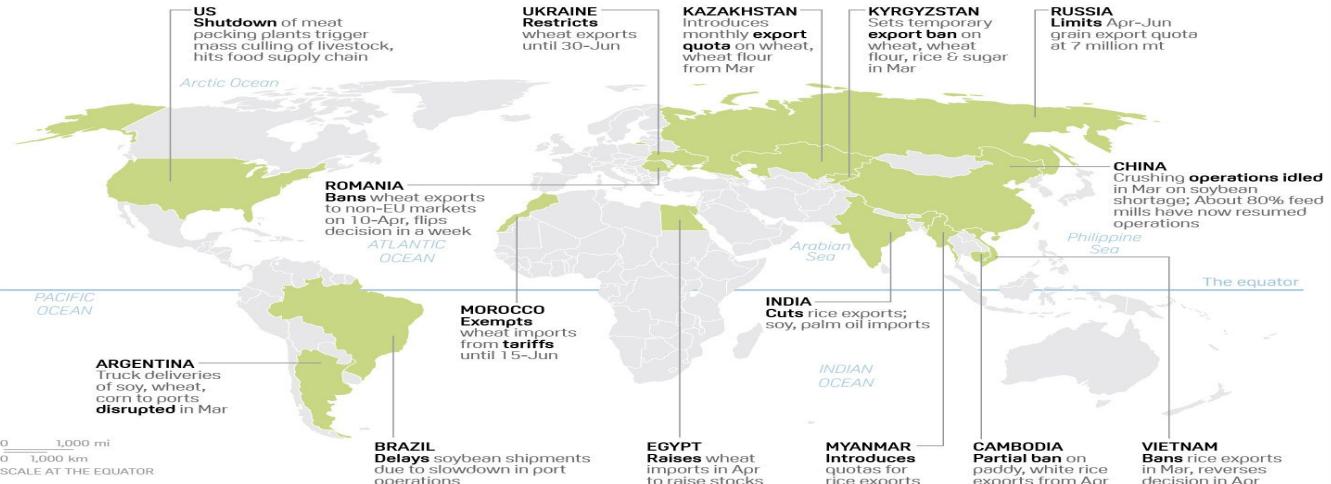
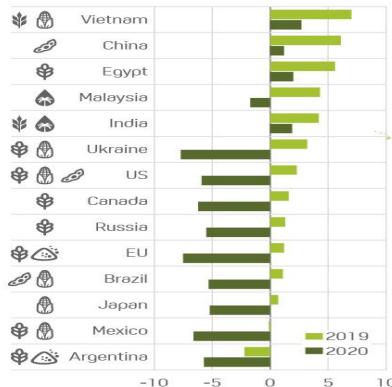
## CORONAVIRUS PANDEMIC TESTS GLOBAL AGRICULTURE SUPPLY CHAIN, STOKES FOOD SECURITY FEARS

The coronavirus pandemic is weighing on the global agriculture supply chain as the world's top producers and consumers deal with a sharp rise in cases. This has forced many to take strict measures, disrupting the normal course of operations. The risk to agriculture supplies, trade and processing chains has never been larger. The Food and Agriculture organization says the impact of the pandemic on economic growth may also affect final demand as consumers lose purchasing power.

- Despite healthy inventories, importers stocked up on wheat products in March on fear of supply risk, pushing prices higher
- Corn has seen the biggest fall-out, hitting multi-year lows on widespread ethanol demand destruction
- Depopulation of livestock in the US due to the idling of meat plants could affect long-term feed demand for corn, wheat and DDGS



### Real GDP, annual change (%)



### Palm oil prices fall as demand tapers off, inventories rise



### US bean future prices remain volatile



### CBOT corn prices plummet on ethanol demand destruction



### Export wheat prices jumped on virus scare, supply concerns

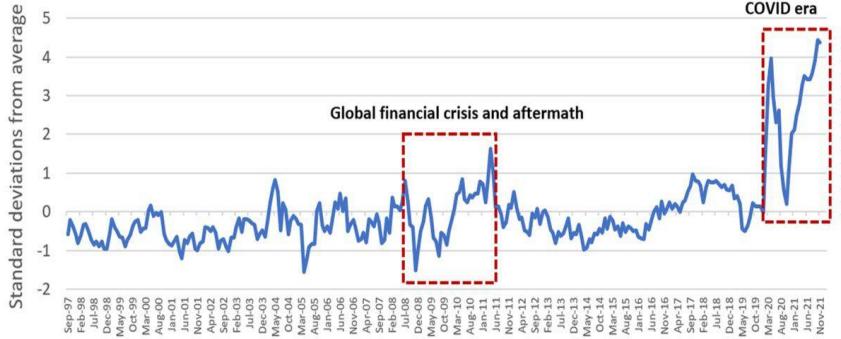


# Other Relevant Trends

## Supply Chain Disruptions

### AMERICAN SHIPPER

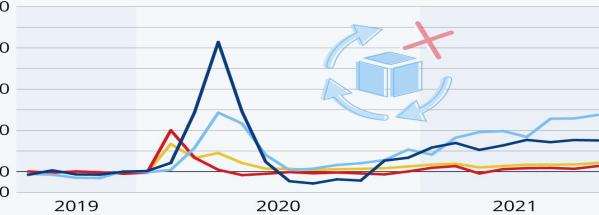
#### Global Supply Chain Pressure Index: 1997-2021



### MAVROUDIS

Index of global supply chain disruptions (100=most disrupted)

Eurozone U.S. China Emerging markets



Based on the difference between the supply delivery times subindex and the supply delivery times based on manufacturing output subindex (both part of the PMI)  
Source: IMF

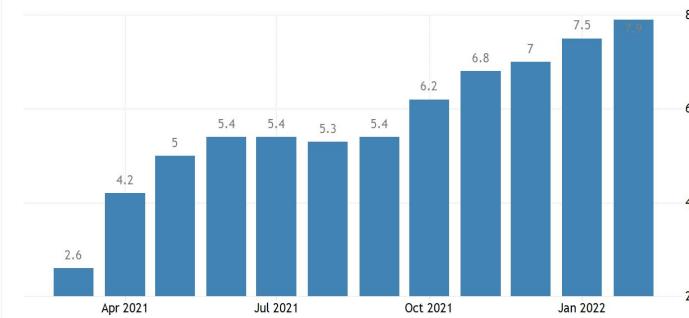
statista

## Inflation

### TRADING ECONOMICS | U.S. BLS



### TRADING ECONOMICS | U.S. BLS



TRADINGECONOMICS.COM | U.S. BUREAU OF LABOR STATISTICS



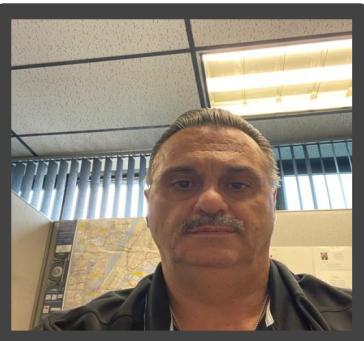
# Red Flags For Future of Food Security in America?



- 1 Supply Chain Disruptions Caused by Current Events
- 2 Rising Inflation and Cost of Living
- 3 Increasing Socioeconomic Disparities
- 4 Increasingly Erratic Weather & Climate Change



# Combating the Issue - Recommendations

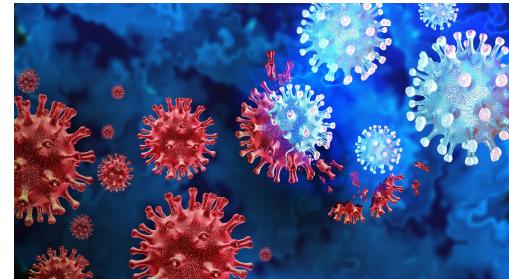


**Mr. Leo Servedio**  
Vice President at  
Teamsters Local 202  
Bronx, New York

- 1 Increase accessibility of resources for families and individuals seeking food/aid via local charities/organizations
  - 2 Require bonuses and incentive pay for truck drivers to be given up front at beginning of contracts with new trucking employees
  - 3 Lowering mandatory age for drivers in all states down to 18 yrs for Class B driver certification, for them to gain experience and knowledge
  - 4 Fund education programs directed at trade schools for truck driver students
- **Jon Samson, testifying on behalf of the American Trucking Association: “Nearly 1 million new drivers will need to be trained and hired in the next decade to keep pace with increase consumer demand and an aging workforce.” (Farm Progress, 2021)**

# Summary

- ❖ Food Insecurity at optimal level in 2019 prior to COVID pandemic
- ❖ Changes since 2019:
  - Food insecurity skyrockets in 2020/2021(45 million Americans of which 15 million are children)
  - Mass Trucking Retirement Movement(Equates to supply chain crisis), Inflation is at highest levels
  - Unemployment rates increased
  - Global supply chain pressures increase with little relief
  - COVID variants(Delta, Omicron)
- ❖ Continuities:
  - Manufacturing recovered(U.S.)
  - Production recovered(U.S.)
  - Increase in knowledge of and access to resources via media(food stamps/food banks)
- ❖ What Was Significant?:
  - Rapidly rising INFLATION(7.9% in Feb. 2022 - 40 year high)
  - Mass trucker retirement(mass distribution job openings caused supply chain problems)
  - Poverty increase
  - Rise in unemployment
- ❖ Predictors: Unemployment, Inflation rate, Breaks in supply/distribution chain(labor shortages), Poverty



# Conclusion

- ❖ **FOOD INSECURITY CAN AFFECT ALL AMERICANS!**
  - Physical Development/Child Development
  - Education
  - Public Health
  - National Economy
- ❖ More Obvious Contributors:
  - Unemployment increases
  - Inflation rate increases
  - Poverty rate increases
- ❖ Less Obvious Contributors:
  - Lack of resources to obtain help
  - Supply/distribution chain breaks/shortages
  - Labor openings in supply/distribution chain
- ❖ Unexpected Findings: Mass aging trucker retirement movement (over 244K people)
- ❖ TAKE ACTION: Go Back to America's Founding Industrial Roots
  - End bipartisan politics
  - Increase awareness of available resources (i.e., backpack programs)
  - Further American innovation to compensate for gaps in supply infrastructure (trucking and railway industry)





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**Thank you.**



# Questions?



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<https://www.npr.org/sections/alltechconsidered/2017/04/09/523024776/farmers-look-for-ways-to-circumvent-tractor-software-locks>
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