PESTICIDES IN FRUITS AND VEGETABLES

Keeshan Williams, PhD.

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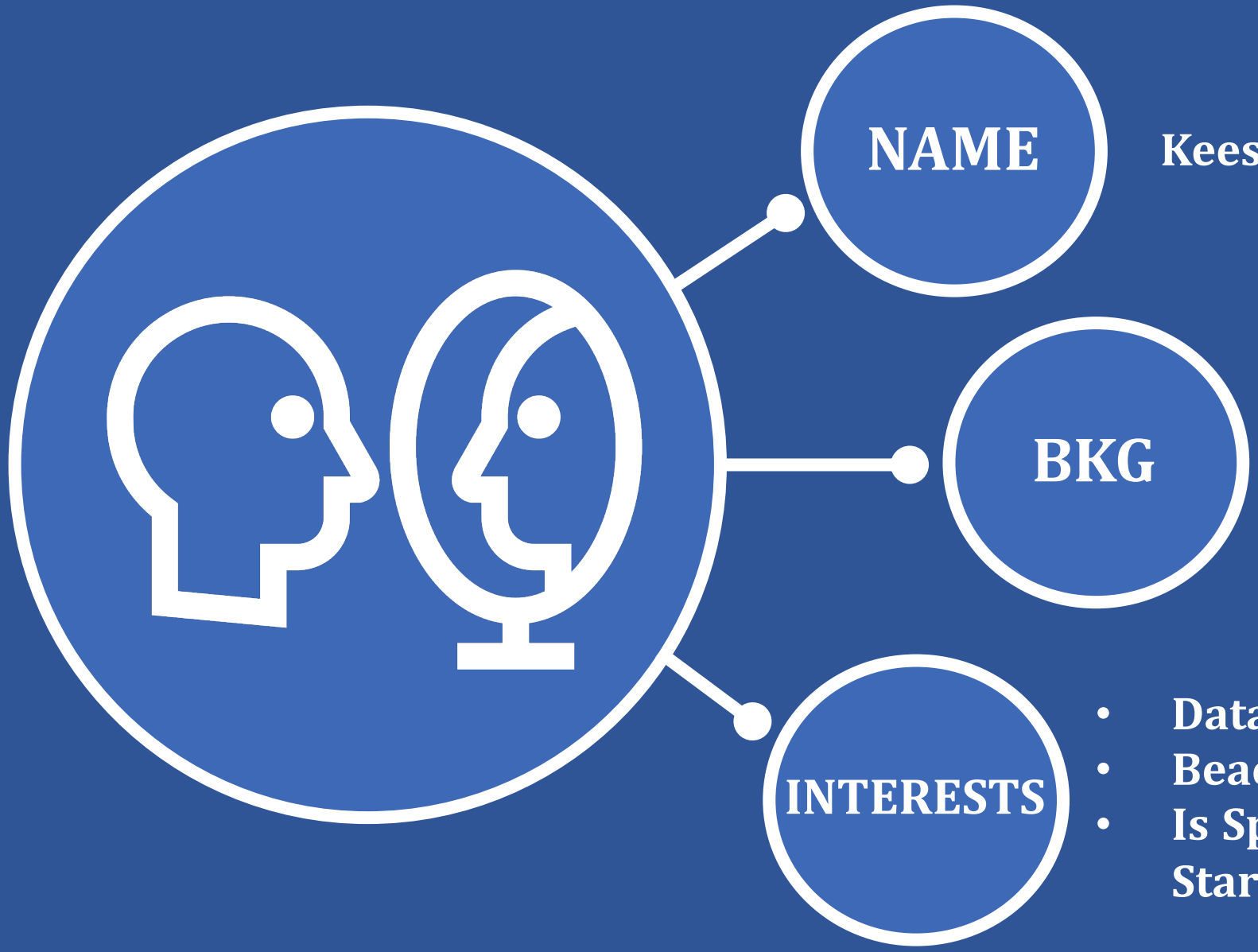
INTRODUCTION



Keeshan Williams, PhD.

2019 - Reg. Affairs Specialist (Medical Devices)
2017 - LT. United States Public Health Service
2013 - Analytical Scientist, FDA
2012 - PhD. Chemical Eng.

- Data Junkie
- Beach and Outdoor enthusiast
- Is Space Force the precursor to Star Fleet?

DATA SET

Obtained from USDA - Pesticide Data Program (PDP)

- Collection, analysis, data entry, and reporting of Pesticide residues on agricultural commodities in the U.S. food supply
- Emphasis on those commodities highly consumed by infants and children
- This data set: 2015 (available for CY 1992 - 2015)
  - 2,333,910 observations, 34 features
  - 10,186 fruits and vegetables analyzed

Pesticide Analysis

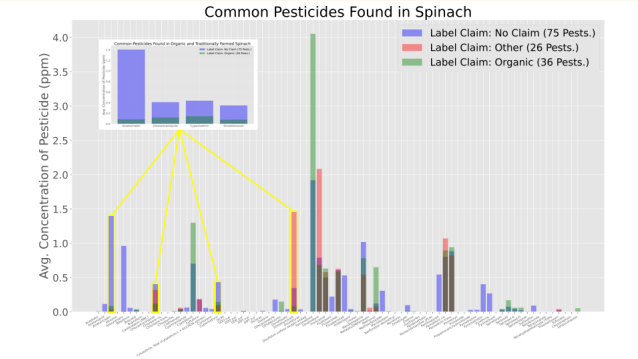
- Samples undergo solvent extraction
- Analyzed against a library of ~ 200 pesticides for matches and concentration

HYPOTHESIS

1. Do fruits and vegetables labeled as "Organic" contain pesticides?
   - USDA Organic Crop Standards:
     - …Crop pests, weeds, and diseases will be controlled primarily through physical, mechanical, and biological controls…when these practices are not sufficient, a biological, botanical, or synthetic substance approved for use on the National List may be used.

2. Is there a significant difference between the amount and levels of pesticides detected in Organic vs. traditionally farmed crops?

Common pesticides found in Spinach, across all label claims



ANALYSIS

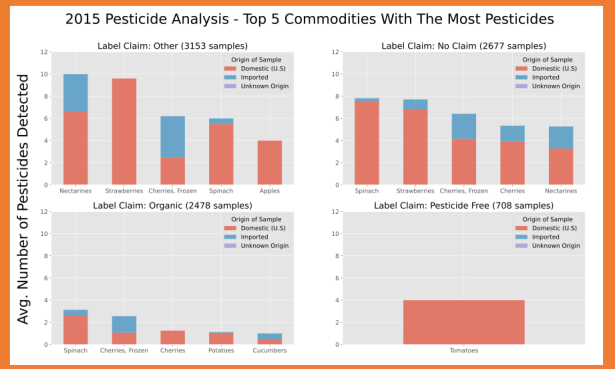
H_0 = There is NO DIFFERENCE in the concentration of pesticides found in Organic vs. traditionally farmed Spinach

H_A = There IS A DIFFERENCE in the concentration of pesticides found in Organic vs. traditionally farmed Spinach

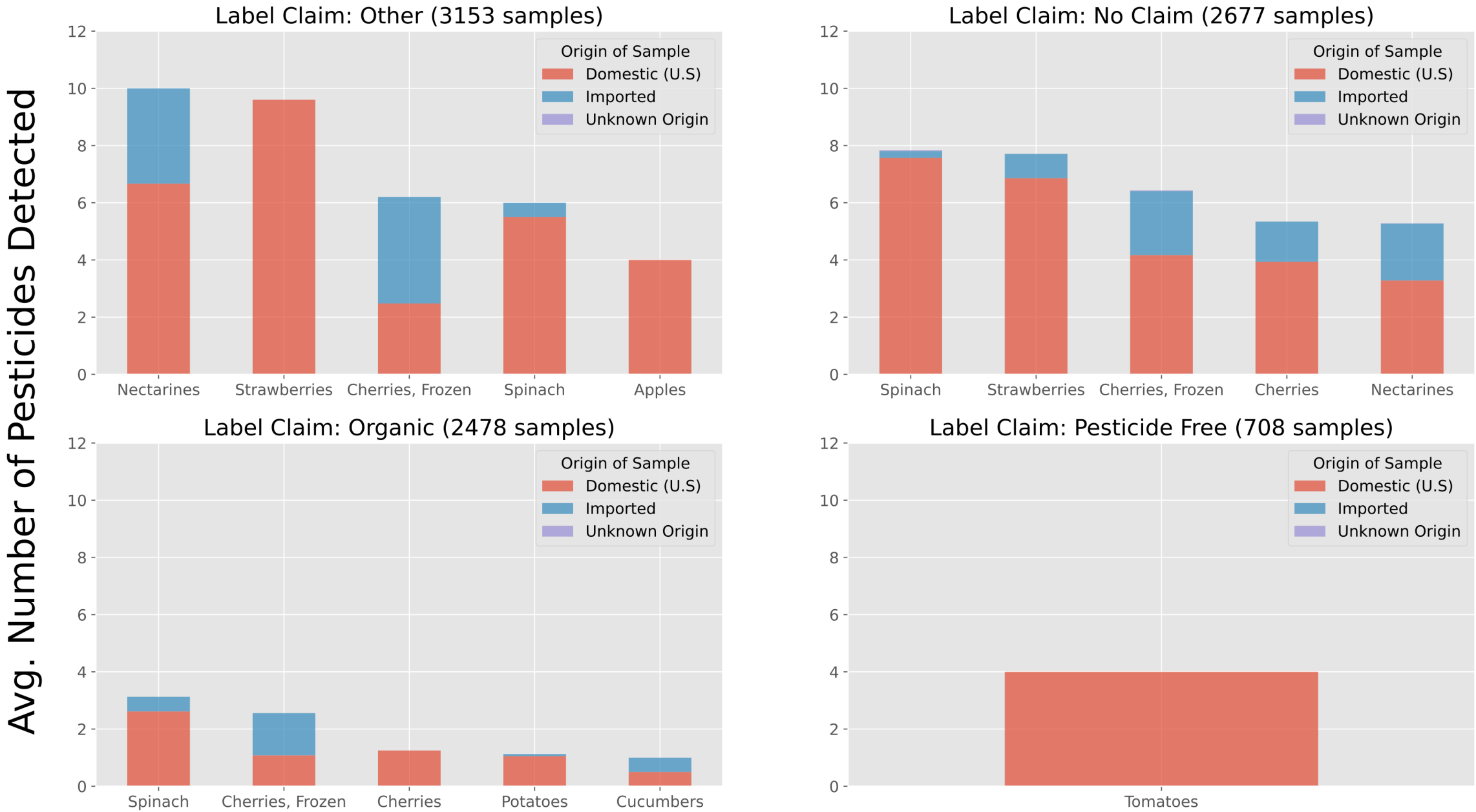
(Welch's t-test; $\alpha = 0.05$)

Pesticide Name	Label: No Claim Avg. Concentration (ppm)	Label: Organic Avg. Concentration (ppm)	Accept or Reject H_0	Number of Samples
Ametoctradin	1.403	0.087	Reject	179
Azoxystrobin	0.963	0.002	Fail to Reject	41
Bifenthrin	0.059	0.003	Fail to Reject	58
Chlorantraniliprole	0.411	0.119	Reject	240
Clothianidin	0.044	0.036	Fail to Reject	212
Cyhalothrin, Total (Cyhalothrin-L + R157836 epimer)	0.058	0.005	Fail to Reject	15
Cypermethrin	0.438	0.145	Reject	130
DDE p,p'	0.009	0.014	Fail to Reject	314
DDT o,p'	0.002	0.002	Fail to Reject	42
DDT p,p'	0.003	0.004	Fail to Reject	87
Dimethomorph	0.348	0.081	Reject	188
Fenamidone	0.790	0.684	Fail to Reject	209
Flonicamid	0.502	0.633	Fail to Reject	176
Fluopicolide	0.610	0.590	Fail to Reject	279
Imidacloprid	0.041	0.020	Fail to Reject	294
Mandipropamid	1.019	0.783	Fail to Reject	460
Methomyl	0.123	0.652	Fail to Reject	39
Permethrin cis	0.803	0.896	Fail to Reject	479
Permethrin trans	0.885	0.943	Fail to Reject	482
Propamocarb hydrochloride	0.029	0.002	Fail to Reject	67
Spinetoram	0.032	0.044	Fail to Reject	371

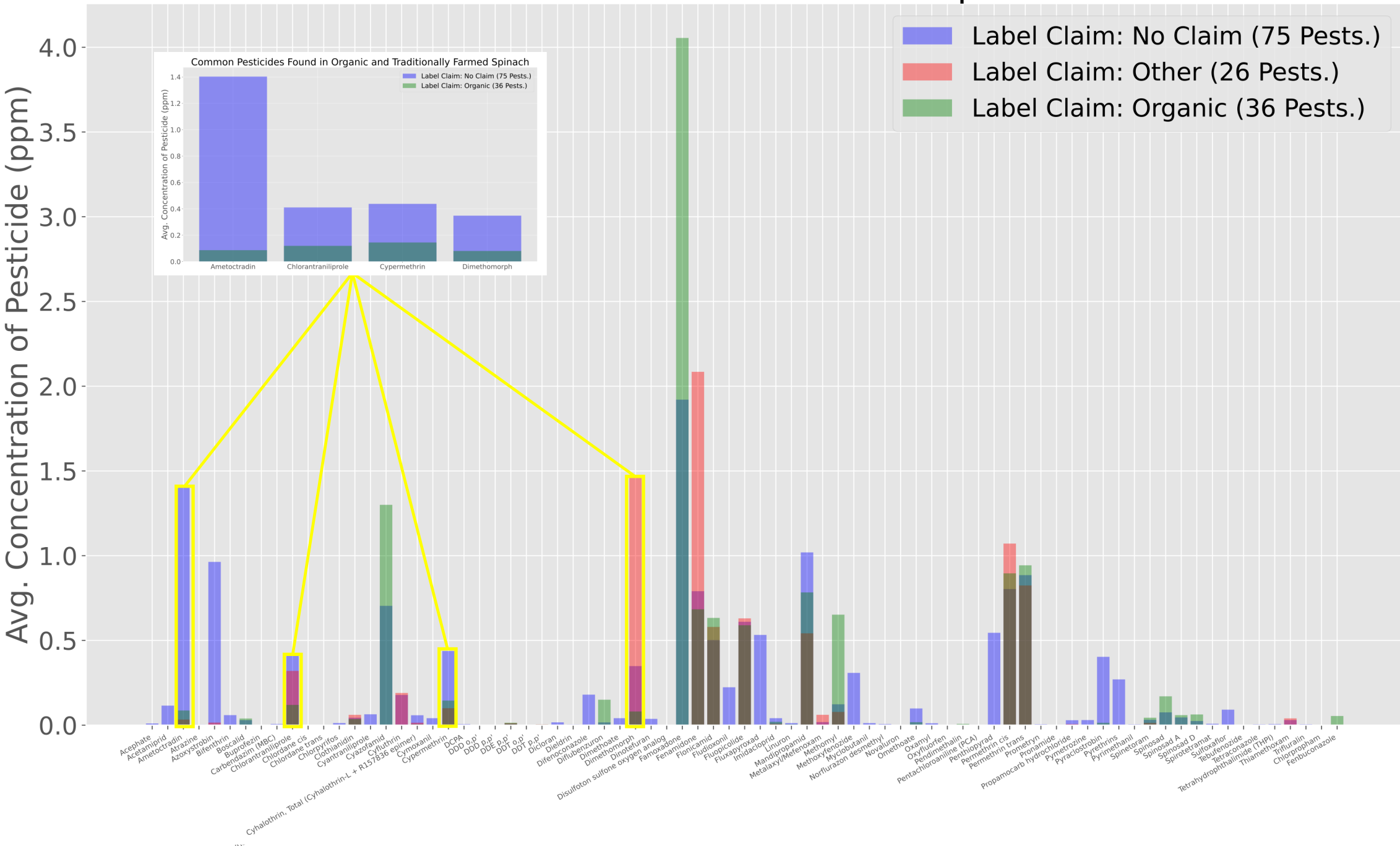
Commodities with the most Pesticides, across all label claims

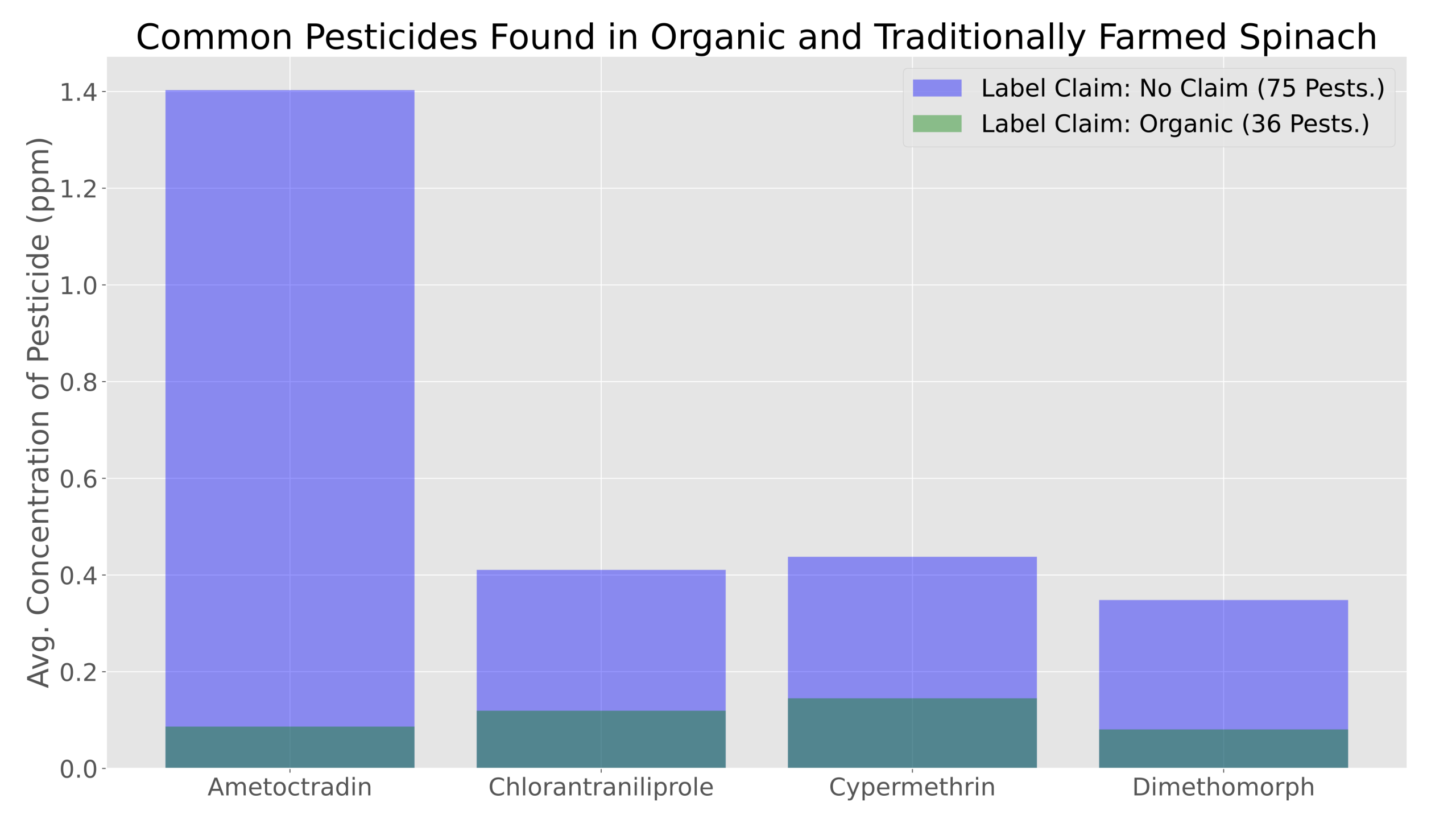


2015 Pesticide Analysis - Top 5 Commodities With The Most Pesticides



Common Pesticides Found in Spinach




Common Pesticides Found in Organic and Traditionally Farmed Spinach
Label Claim: No Claim (75 Pests.)
Label Claim: Organic (36 Pests.)
Avg. Concentration of Pesticide (ppm)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Ametoctradin
Chlorantraniliprole
Cypermethrin
Dimethomorph

Pesticide Name	Label: No Claim Avg. Concentration (ppm)	Label: Organic Avg. Concentration (ppm)	Accept or Reject Ho	Number of Samples
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CONCLUSIONS

- **Organically grown fruits and vegetables contain pesticides!**
  - **19 different commodities analyzed for 2015**
- **In most cases…Fail to reject H_0 !**
- **There is <u>NO DIFFERENCE</u> in the concentrations of pesticides found in Organic as compared to traditionally farmed Spinach.**