

**Analysis on adverse events
related to foods, dietary supplements, and cosmetics
from year 2004 – 2016**

Huilin Hu
University of Wisconsin - Madison

Motivation

- People care about life quality more than ever before. Especially, food safety problem has drawn increasing attention.
- My personal interest: 1 year part time work experience

Goal:

- Which categories of products causing most adverse events
- Which people are more vulnerable to a specific kind of food or products.
- If any regulations on certain industries should be developed.

Data

- Provided by FDA
- extracted from the CFSAN Adverse Event Reporting System from year 2004 to 2016.
- CSV format: 11 variables, 80170 pieces of data
- Size: 18 MB

Data (cont.)

RA_Report #	RA_CAERS Cr	Year	Start_Date	Role	Brand/Product	PRI_FDA Indi	Industry	Age	Age Unit
108680	12/22/08	2008	11/15/08	Suspect	WOMEN TO WOMEN'S	54	Unconventio	55	Year
147096	12/27/11	2011	12/6/11	Concomitant	VITAMIN D3	54	Unconventio	66	Year
176500	5/15/14	2014	4/20/14	Concomitant	VITAMIN B-12	54	Unconventio	88	Year
100684	2/25/08	2008	1/30/07	Suspect	PROBIOTIC MPF	54	Unconventio	59	Year

Gender	AEC_One Row Outcomes	SYM_One Row	Age_interval	life_threaten
Female	VISITED AN ER, SERIOUS INJURIES/ ILLNESS, HOSPITALIZATION	HOT FLUSH,	41-60	0
Female	OTHER SERIOUS (IMPORTANT MEDICAL EVENTS), LIFE THREATENING	DYSPNOEA,	61-80	1
Male	OTHER SERIOUS (IMPORTANT MEDICAL EVENTS), VISITED AN ER	DYSPHAGIA,	81-100	0
Female	VISITED A HEALTH CARE PROVIDER, HOSPITALIZATION	FATIGUE, MA	41-60	0
Female	LIFE THREATENING	HERPES VIRU	41-60	1

Preliminary analysis

Top 10 industrial categories causing adverse events
(by gender and age group)

	Babies (age less than 1 month)	Infants (age less than 12 months but greater than 1 month)	Children and adults (age greater than or equal to 1 year)
Female	Baby Food Prod, Unconventional_food, Cosmetics, Dietary Conv Food, Soft Drink, Vegetables, Egg	Baby Food Prod, Unconventional_food, Cosmetics, Dietary Conv Food, Soft Drink, Bakery Prod, Milk, Fruit, Nuts, Coffee	Unconventional_food, Cosmetics, Nuts, Dietary Conv Food, Bakery Prod, Vegetables, Fishery, Soft Drink, Milk, Fruit
Male	Baby Food Prod, Unconventional_food, Cosmetics, Soft Drink, Dietary Conv Food, Ice Cream Prod	Baby Food Prod, Unconventional_food, Dietary Conv Food, Cosmetics, Milk, Soft Drink, Fruit, Nuts, Bakery Prod, Vegetables	Unconventional_food, Fishery, Nuts, Cosmetics , Bakery Prod, Soft Drink, Fruit, Vegetables, Dietary Conv Food, Milk

Data Visualization (1) - overall

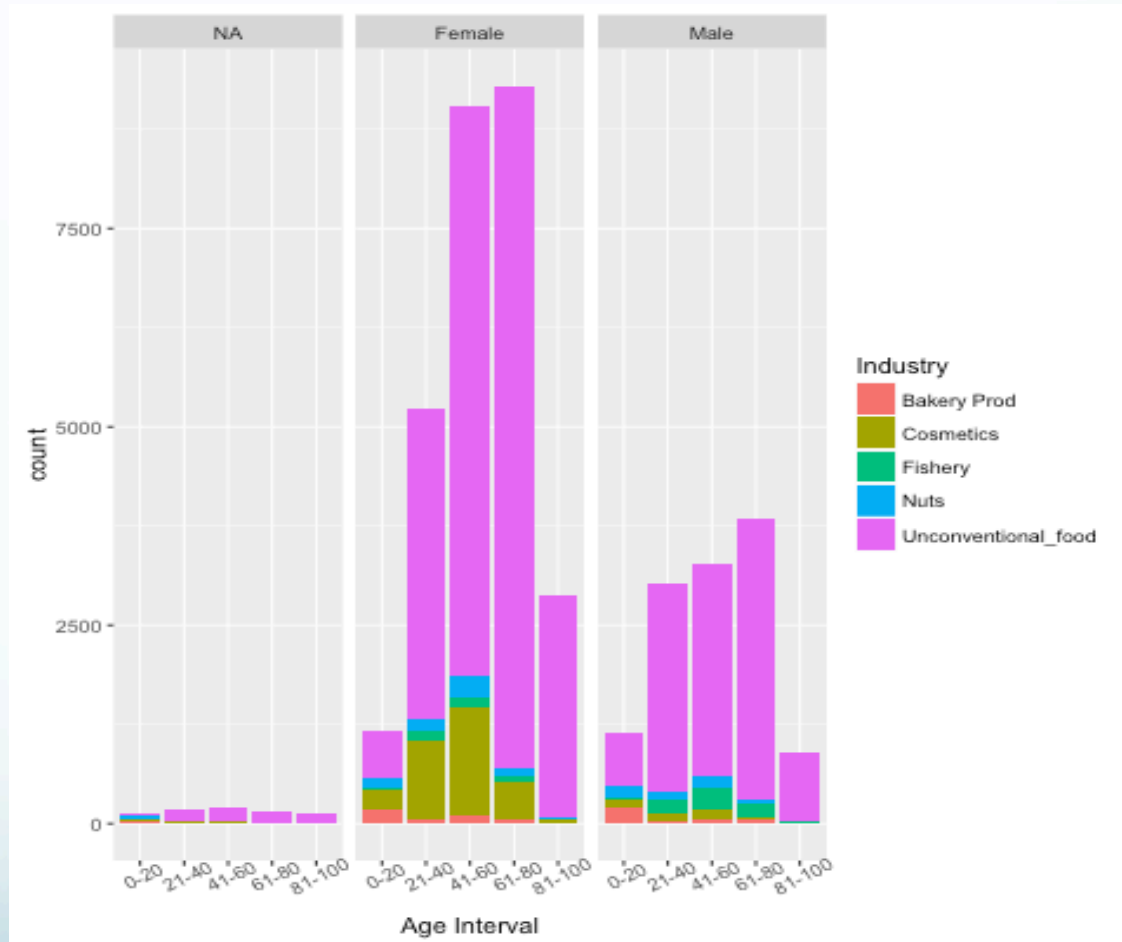
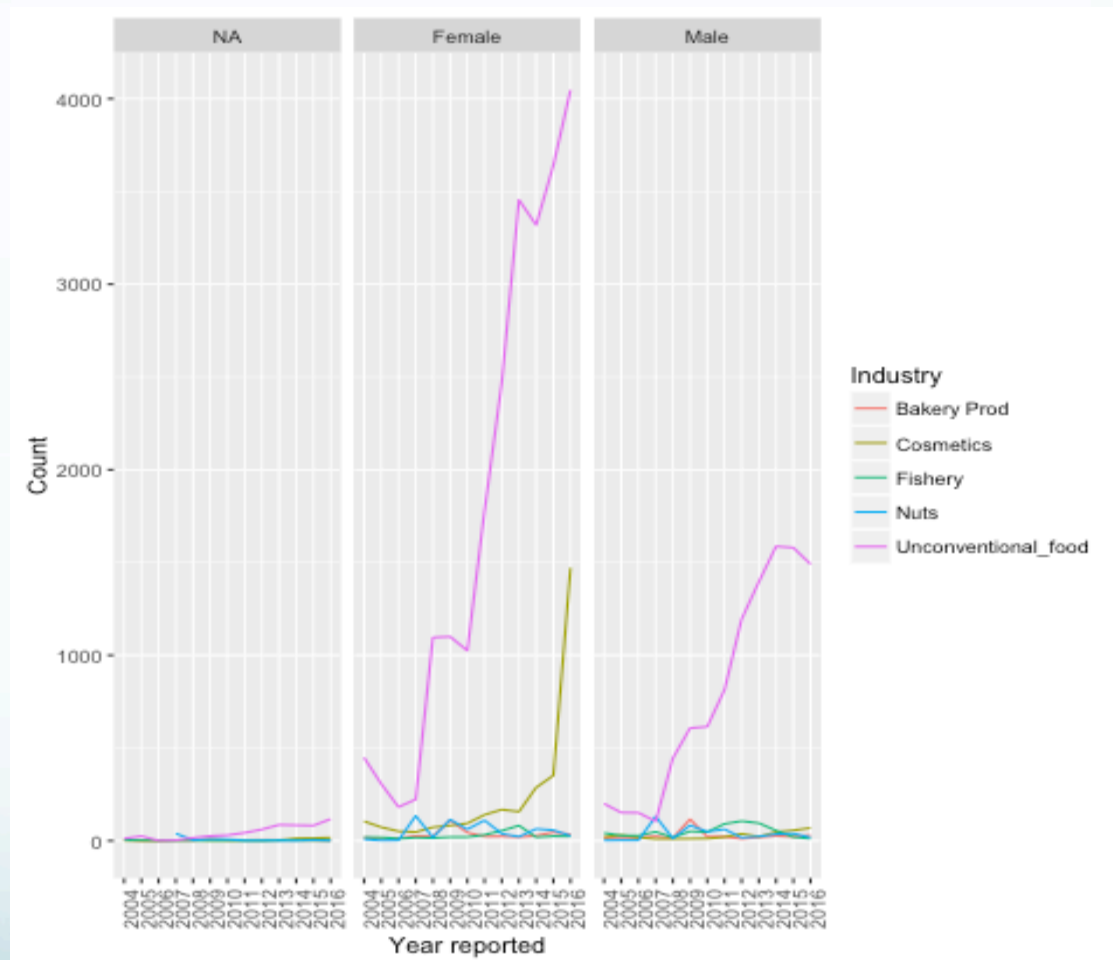


Figure 1: Frequency of adverse events on children and adults group by industry

Data Visualization (2) - overall



- Figure 2: Trend of frequency of adverse events on children and adults group by industry

Data Visualization (3)

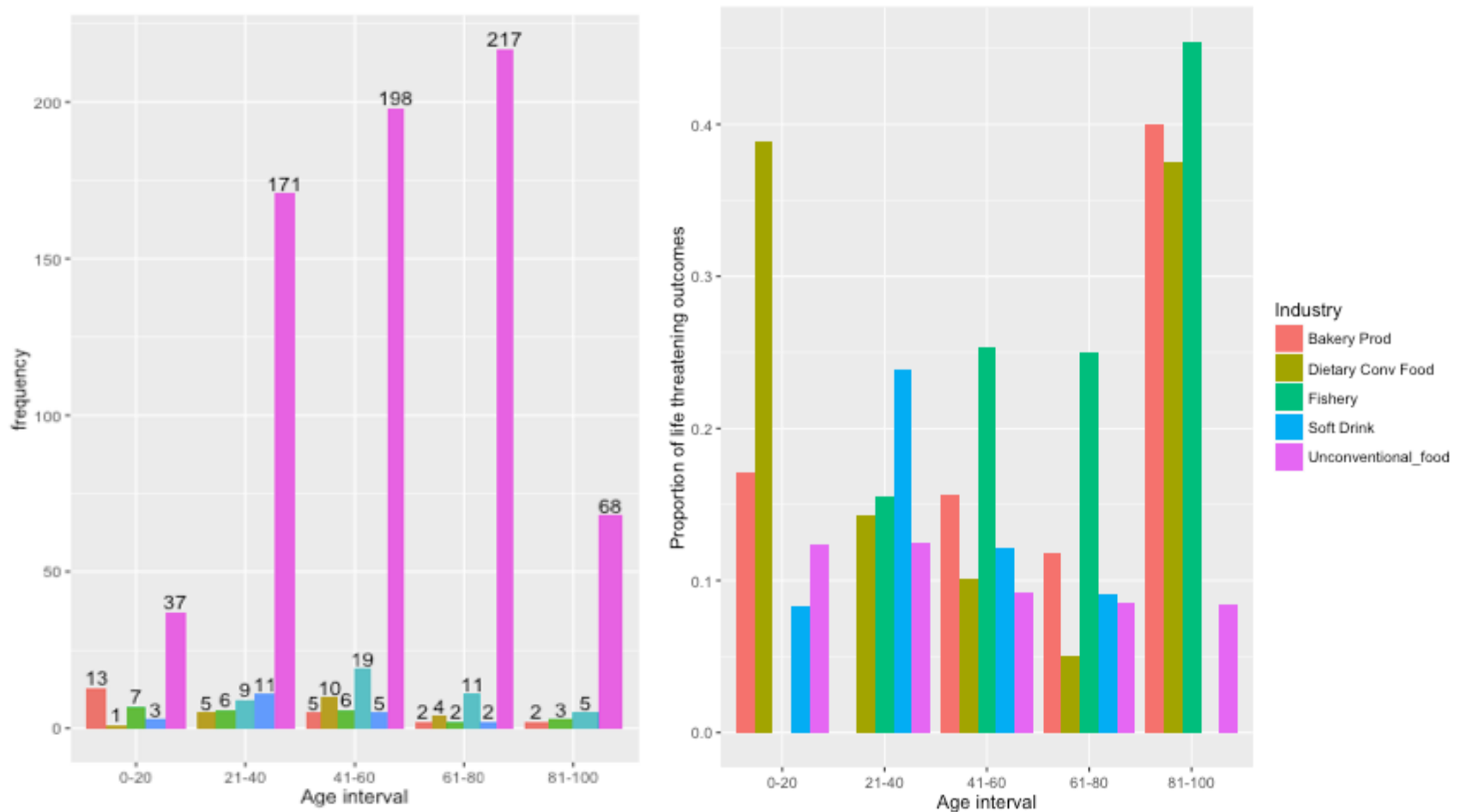


Figure 3: Frequency (left) and proportion (right) of life-threatening results by industries

Analysis

- Exploring factors resulting in worst outcome (life threatening or death)
- **A decision tree** was built to predict death or life threatening by industry, gender and age.
- Feature importance scores

Analysis (cont.)

- Model 1: all age groups

Industry: 0.30880775, Age: 0.65859297, Gender: 0.03259929

- Model 2 (age group 20-40):

Industry: 0.40440189, Age: 0.5121695 , Gender: 0.08342861

- Model 3 (age group 40-60):

Industry: 0.47385953, Age: 0.48824346, Gender: 0.03789701

Analysis (cont.)

- Logistic regression model for each age group:
- **Log ratio** of life threatening outcome modeled by industry, gender.
- Followed by **Wald test**: test if a single category yields **proportion** (positively correlated with log ratio) of worst outcome higher than other categories combined.

Analysis (cont.)

- Output for model (age 61 - 80) in R:

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-16.2473	445.5849	-0.036	0.971
IndustryCosmetics	-1.2002	0.9108	-1.318	0.188
IndustryDietary Conv Food	-0.9576	1.0468	-0.915	0.360
IndustryFishery	0.7896	0.8323	0.949	0.343
IndustrySoft Drink	-0.3088	1.0583	-0.292	0.770
IndustryUnconventional_food	-0.3187	0.7574	-0.421	0.674
GenderFemale	14.0975	445.5843	0.032	0.975
GenderMale	14.4488	445.5843	0.032	0.974

Analysis (cont.)

- Results:
- Age group (21-40): Soft drink (insignificant)
- Age group (41-60): Fishery (significant)
- Age group (61-80): Fishery (significant)
- Age group (81 and above): Fishery, but almost same as Bakery and Dietary conventional food

Data Visualization (4)

Word cloud by ManiWordle (WHAT I EXPECTED)



Data Visualization (4)



pride

- Figure 4: Text exploration on Unconventional food resulting in extreme outcome

Data Visualization (4)



PURITANS pride

- Figure 4: Text exploration on Unconventional food resulting in extreme outcome



Thank you!