

Health Tradeoffs in Pesticide Regulation

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Overview

- Regulators seek to protect the public from carcinogenic pesticide residues on food
- Pesticide bans lower exposure to residues, but may increase fruit and vegetable prices
- Fruit and vegetables have beneficial health effects
- Reduced consumption can lead to increased incidence of disease

Pesticide Regulation and Food

- Focus is on minimizing cancer risk from pesticide residues on food
- Regulators sets crop-specific tolerances for every pesticide, and bans chemicals found to pose high risks
- Risk determined by evidence from laboratory animal tests


“When your mother said, ‘Eat your vegetables,’ she was right. Research strongly indicates that approximately one-third of cancer deaths that occur each year in the U.S. can be prevented by eating well and being more active”



The latest in cancer prevention
from our epidemiologists,
behavioral scientists, and your mom.

When your mother said, ‘Eat your vegetables,’ she was right. Research strongly indicates that approximately one-third of cancer deaths that occur each year in the U.S. can be prevented by eating well and being more active. So we’re promoting policy decisions and community programs that encourage good nutrition and increased physical activity—to help everyone adopt healthier lifestyles. These are just a few of the many ways we’re working to prevent cancer. With your help, we can do even more. To find out how you and your organization can get involved, please contact us.

Hope. Progress. Research. / 1-800-ACS-2325 / www.cancer.org



Indirect Health Effects

- Production response (price increase from removing a chosen input)
- Consumption response (consumer react to increased prices)
- Dose response (health impact of dietary change)

Pesticides and Prices

Crop	Impact	Output Change (%)	Price Change (%)	Consumer Spending
Grapes	Mean	-19	29	-358
	High	-52	87	-1031
Lettuce	Mean	-9	57	-321
	High	-28	175	-931
Oranges	Mean	-21	13	-53
	High	-41	29	-114

Source: Zilberman *et al.* (1991). Consumer spending is in hundred thousands of 1990 dollars. High impact estimate is the value which may be exceeded with a 5% probability.

Consumption Changes

- Response given by USDA elasticities for fruits and vegetables, by income group (Huang and Lin, 2000)
- Consumer baselines given by USDA Continuing Study of Food Intakes by Individuals, 1994-1996, 1998
- Each individual is a unit of observation (n=18,081)

Health Risk Changes

- Medical response from findings relating fruit and vegetable intake to ischemic stroke and heart disease
- Estimate parameterized dose-response functions
- Use estimated functions to relate changes in consumption behavior to health outcomes

Health Effects of Fruits and Vegetables

Intake of Fruits and Vegetables				
	1 st Quintile	3 rd Quintile	5 th Quintile	1 serving/day
Ischemic Stroke				
Women	1.0	0.75	0.74	0.93
Men	1.0	0.70	0.61	0.96
Pooled	1.0	0.73	0.69	0.94
Coronary Heart Disease				
Women	1.0	0.88	0.80	0.97
Men	1.0	0.95	0.80	0.96
Pooled	1.0	0.92	0.80	0.96

Source: Joshipura *et al.* (1999); Joshipura *et al.* (2001). Relative risks by quintile of intake are relative to the risk for the lowest quintile of intake. One serving per day is risk reduction per one-serving increment.

Simulations

- Assume a small change in the price of fruits and vegetables
- Calculate changes in fruit and vegetable intake using CSFII consumption data
- Find increase in individual health risks
- Calculate the increased incidence in relevant subpopulations

Results: Induced Disease

Disease	All Fruits	All Vegetables	All Fruits and Vegetables
Coronary Heart Disease	1,442 (61.72)	2,951 (67.77)	6,903 (145.36)
Ischemic Stroke	744 (33.86)	1,482 (37.16)	3,022 (68.25)
Total	2,186 (81.54)	4,433 (94.47)	9,925 (183.52)

Cases Induced by a 1% Price Increase in all fruits and vegetables. Results reported are the simulation means and standard errors from a series of Monte Carlo trials (n=100,000). Low income refers to families below 130% of poverty line; high income households are above 300% of this level.

Distributional Effects

- Those who most gain from a reduction in pesticide residue are those who consume the most fruits and vegetables
- FQPA charges regulators with considering “dietary consumption patterns and variations in the sensitivities of major identifiable subpopulations”

Distributional Analysis

- Assume linear dose-response functions for dietary cancer risk (per EPA practice)
- Look at a break-even scenario involving no net loss of lives
- Use CSFII consumption data to calculate distribution of averted cancers across population groups

Distribution over Income

For All Fruits and Vegetables in a Break-Even Scenario

Health Outcome	All Incomes	Low Income	Medium Income	High Income
Cancers Avoided	9,925	1,606	3,096	5,223
Cases Induced	9,925	1,720	3,257	4,949
Change	0	+ 114	+ 161	- 274

“Cancers Avoided” calculated assuming a linear dose-response function for cancer. “Cases Induced” is the total of ischemic stroke and coronary heart disease from previous tables. Columns may not sum perfectly due to rounding.

Distribution over Race

For All Fruits and Vegetables in a Break-Even Scenario

Health Outcome	Total	Asian	Black	Hispanic	White	Other
Cancers Avoided	9,925	347	1,159	511	7,298	611
Cases Induced	9,925	296	1,159	542	7,268	585
Change	0	- 51	+ 75	+ 31	- 29	- 26

“Cancers avoided” and “Cases induced” calculated as in previous tables. “Hispanic” refers to self-identified white hispanics, “white” denotes self-identified whites not of hispanic origin, and “black” refers to self-identified blacks of both hispanic and non-hispanic origin.

Distribution over Communities

For All Fruits and Vegetables in a Break-Even Scenario

Health Outcome	Total	Urban	Suburban	Rural
Cancers Avoided	9,925	3,181	4,754	1,989
Cases Induced	9,925	3,126	4,690	2,108
Change	0	- 55	- 64	+ 119

Urban refers to consumers in the central cities of MSAs, suburban refers to MSA consumers outside of central cities, and rural refers to non-MSA consumers. Columns may not sum perfectly due to rounding. “Cancers avoided” and “Cases induced” calculated as in previous tables.

Nutrition Subsidies

- Positive health outcomes can be achieved by subsidizing fruits and vegetables
- If we know the average cost per serving, we can estimate the cost per life saved
- Such programs may prove to be more cost-effective than many other health interventions

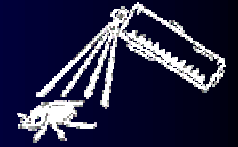
Cost Per Life Saved

by Avoiding Heart Disease and Strokes through Subsidies

Health Outcome	All Incomes	Low Income	Medium Income	High Income
Fruits and Vegetables	1.29	1.02	1.19	1.45
Fruits	2.19	1.82	2.17	2.31
Vegetables	1.80	1.33	1.62	2.12

Present Value of a forty-year subsidy of one percent of retail price. Low income refers to families below 130% of the poverty income guidelines, and high income households are above 300% of this level. All numbers are in millions of U.S. dollars.

In Summary



- Even small price changes can have substantial health impacts through consumption changes
- These impacts can mitigate or even negate the direct health benefits of a pesticide ban
- These changes may transfer risks in socially undesirable ways

Toward Better Regulation

- This is not an anti-organic, or even pro-pesticide story; problem is the regulatory focus
- EPA often deals with low levels of cancer risk
- Cancer risk is not a good proxy for other concerns that receive less attention
- As we learn more about diet-health links, we should factor them into our regulatory decision-making process