

Influenza Vaccination and the Risk of
All-Cause and Coronary Heart Disease
Mortality in Older Adults:
The Cardiovascular Health Study

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Background

- Excess CVD deaths during influenza epidemics
- Respiratory infections and increased risk of acute MI
- Potential roles for infections in acute CV events and atherosclerosis
- Observational studies of influenza vaccinations
 - 27% - 38% lower risks of all-cause mortality
 - 49% lower risk of out-of-hospital primary cardiac arrest
 - 67% lower risk of recurrent, non-fatal MI

Study setting

- Cardiovascular Health Study (CHS)
- Participants identified from Medicare lists
- 5,435 participants alive on Oct. 1, 1993
- Annual clinic examinations and interviews
- 5 years of follow-up utilized (1993 - 1997)

Exposure assessment

- Self-reported “flu shot during the past year”
- Assumptions:
 - Influenza vaccinations administered beginning October 1 of each year
 - Participants reported vaccination status during 12 months prior to CHS visits
 - Vaccination information carried forward
- Vaccination status estimated for each point in time

Analysis 1: Time-dependent (TD)

- Time-dependent vaccination status
- Currently vaccinated vs currently unvaccinated
- Participants allowed to change exposure groups every October 1

Analysis 2: Non-time dependent

- Classified participants as:
 - Vaccinated in both 1992 and 1993 (concordant)
 - Vaccinated once in 1992 or 1993 (discordant)
 - Unvaccinated in both 1992 and 1993 (reference)
- Two comparisons:
 - Concordant vaccinated vs reference (NTDC)
 - Discordant vaccinated vs reference (NTDD)

- Outcomes:
 - All-cause mortality
 - CHD mortality
 - Non-CHD mortality
- Analyses:
 - Entire follow-up period
 - Influenza seasons
 - Non-influenza seasons
- Adjustment: Age, general health, prevalent CVD, renal insufficiency, smoking, income

Participant characteristics at baseline, by vaccination status

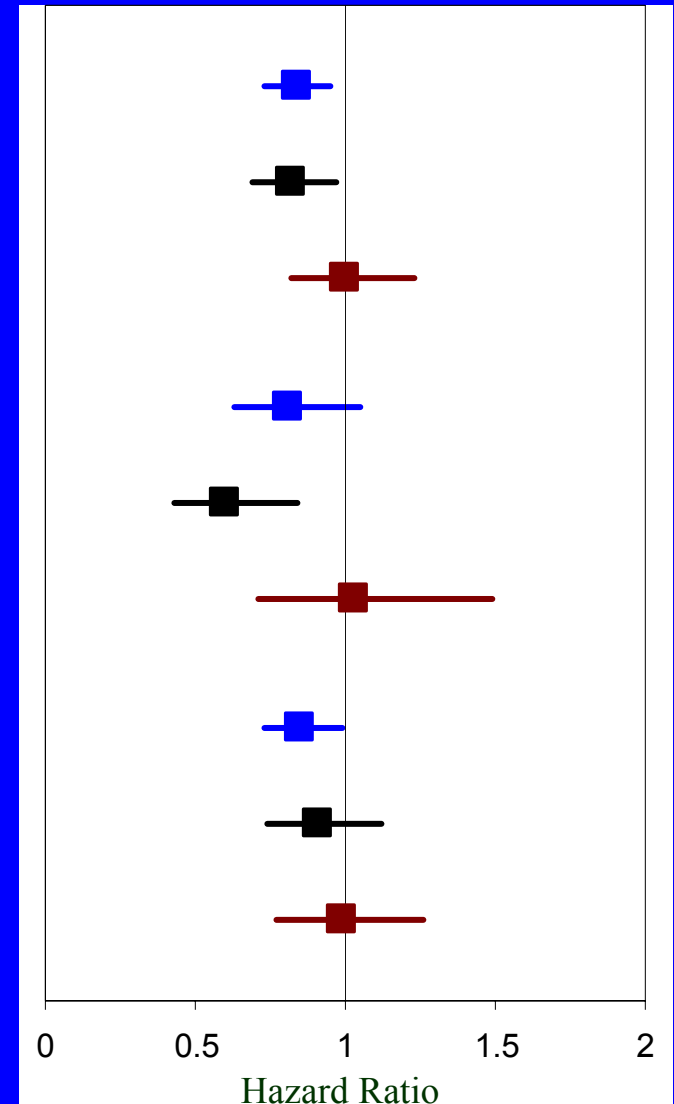
	Vaccinated n = 2,984	Unvaccinated n = 1,654
Age, yrs	77.0 (5.3)	76.7 (5.6)
Male (%)	41.3	38.6
Caucasian (%)	86.3	75.6
Education >High School (%)	48.0	38.9
Marital Status - Married (%)	69.9	60.5
Income <\$15,999 (%)	34.8	49.3
Smoking (%)		
Never	46.1	47.4
Former	46.5	40.9
Current	7.5	11.7

Participant characteristics at baseline, by vaccination status

	Vaccinated n = 2,984	Unvaccinated n = 1,654
General Health – Good to Excellent (%)	76.2	77.3
Treated Hypertension (%)	46.9	41.5
Total Cholesterol, mg/dL	208.0	212.8
Diabetes Mellitus (%)	16.0	16.9
Pulmonary Disease (%)	10.7	7.1
Renal Insufficiency (%)	5.0	3.8
Prevalent CHD (%)	25.5	20.1
Prevalent CBD (%)	10.2	9.4

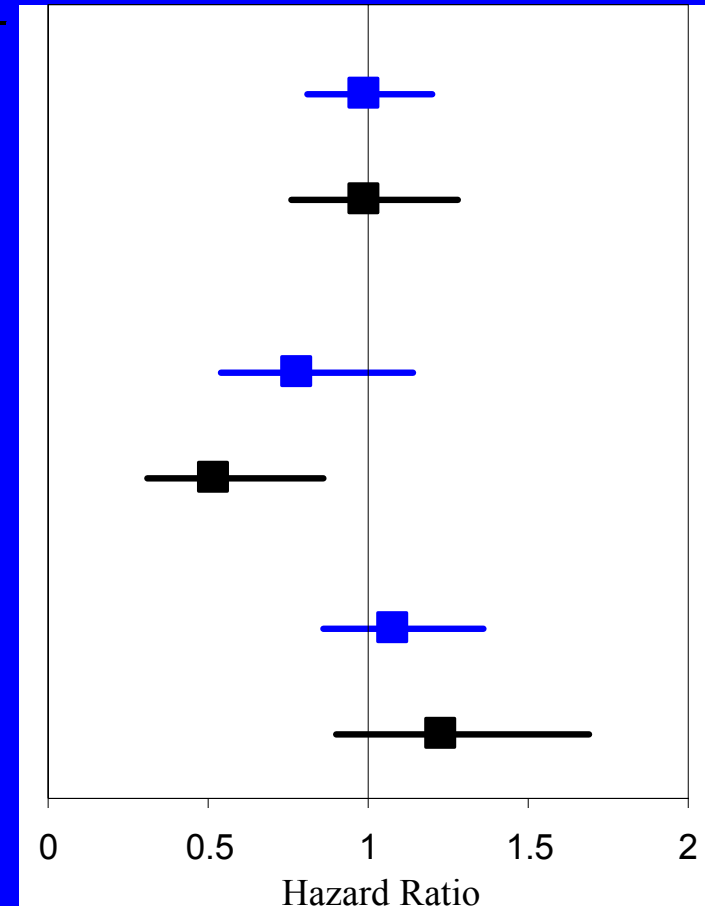
Associations of vaccination status and fatal outcomes over entire follow-up period.

Mortality	Analysis	HR
All-Cause	TD	0.84
	NTDC	0.82
	NTDD	1.00
CHD	TD	0.81
	NTDC	0.60
	NTDD	1.03
Non-CHD	TD	0.85
	NTDC	0.91
	NTDD	0.99



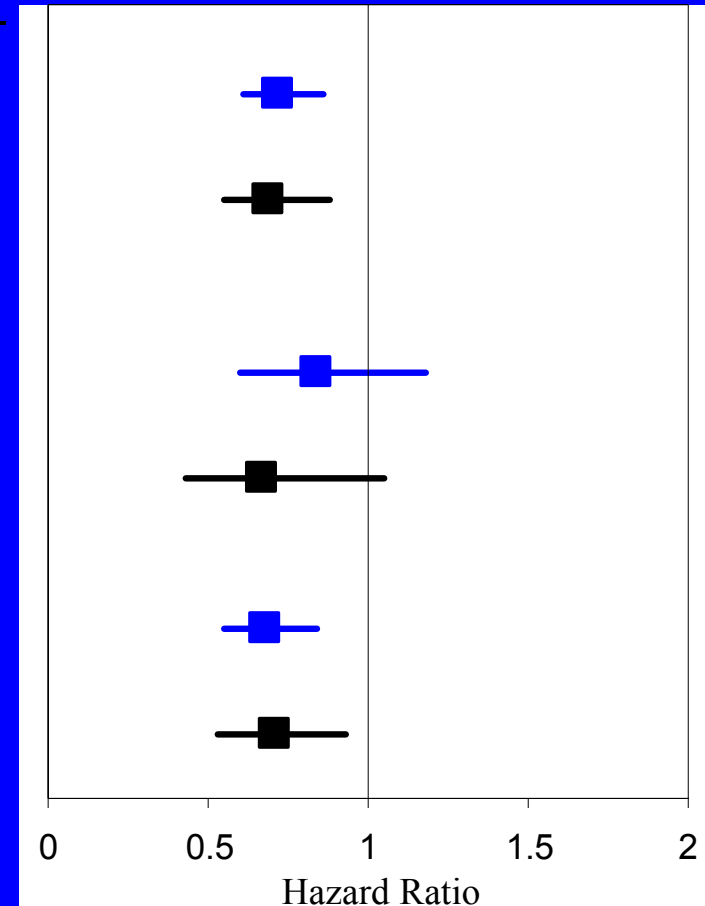
Associations of influenza vaccination status and fatal outcomes during influenza seasons.

Mortality	Analysis	HR
All-Cause	TD	0.99
	NTDC	0.99
CHD	TD	0.78
	NTDC	0.52
Non-CHD	TD	1.08
	NTDC	1.23



Associations of influenza vaccination status and fatal outcomes during non-influenza seasons.

Mortality	Analysis	HR
All-Cause	TD	0.72
	NTDC	0.69
CHD	TD	0.84
	NTDC	0.67
Non-CHD	TD	0.68
	NTDC	0.71



Limitations

- Misclassification of vaccination status
- Residual confounding, including selection bias
- Use of national influenza surveillance data for determining influenza seasons
- Generalizability

Conclusions

- Influenza vaccination was associated with lower risks of all-cause and non-CHD mortality in older adults, primarily during non-influenza seasons.
- Vaccination was associated with lower risk of CHD mortality, particularly during influenza seasons.
- Association with lower CHD mortality risk appears to be stronger with repeated rather than current vaccination.