COVID-19 Deaths Reported in Vermont, 2020-2024:
What Can We Learn?

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Vermont Immunization & Infectious Disease Conference

May 21, 2025

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Vermont Immunization & Infectious Disease Conference
Hotel Champlain, Burlington, VT
May 21, 2025
Session III – From Viruses to Superbugs: Unraveling Infectious Disease Outbreaks and Investigations
Speakers: Laura Ann Nicolai, MPH, Christine Connor, MSN, MPH, RN, Allison Lafferty, MD, and John Davy, PhD

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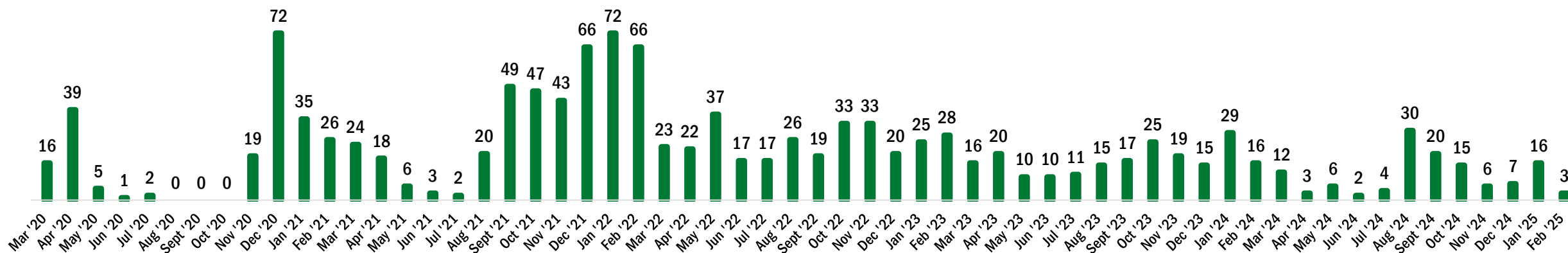
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This program has been reviewed and is acceptable for up to 5.0 Nursing Contact Hours.

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This activity was planned by and for the healthcare team, and learners will receive 5.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Vermont Monthly COVID-19 Deaths*

Mar '20: 16, Apr '20: 39, May '20: 5, Jun '20: 1, Jul '20: 2, Aug '20: 0, Sept '20: 0, Oct '20: 0, Nov '20: 19, Dec '20: 72, Jan '21: 35, Feb '21: 26, Mar '21: 24, Apr '21: 18, May '21: 6, Jun '21: 3, Jul '21: 2, Aug '21: 20, Sept '21: 49, Oct '21: 47, Nov '21: 43, Dec '21: 66, Jan '22: 72, Feb '22: 66, Mar '22: 23, Apr '22: 22, May '22: 37, Jun '22: 17, Jul '22: 17, Aug '22: 26, Sept '22: 19, Oct '22: 33, Nov '22: 33, Dec '22: 20, Jan '23: 25, Feb '23: 28, Mar '23: 16, Apr '23: 20, May '23: 10, Jun '23: 10, Jul '23: 11, Aug '23: 15, Sept '23: 17, Oct '23: 25, Nov '23: 19, Dec '23: 15, Jan '24: 29, Feb '24: 16, Mar '24: 12, Apr '24: 3, May '24: 6, Jun '24: 2, Jul '24: 4, Aug '24: 30, Sept '24: 20, Oct '24: 15, Nov '24: 6, Dec '24: 7, Jan '25: 16, Feb '25: 3

Until February 2025, Vermont shared provisional deaths by age group and month to inform the public about the burden and risks of COVID-19. COVID-associated death totals are still reported by CDC.

How should the public interpret this information?

How have COVID-19 related deaths changed since the onset of the pandemic?

*All death counts 2023-2024 are provisional

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CSTE COVID-19 Death Classification

Revised COVID-19-associated death classification[3]

The death certificate indicates COVID-19 or an equivalent term as an immediate, underlying, or contributing cause of death.

OR

A case investigation for a confirmed, probable, or suspect SARS-CoV-2 infection case[4] **determined that COVID-19 was the cause of death or contributed to the death[5]**

The CSTE 2022 Update to the Standardized Surveillance Case Definition and National Notification for SARS-CoV-2 Infection classifies a case as suspect if vital records criteria are met without confirmatory or

---

CAUSE OF DEATH:

Immediate Cause:(Final disease or condition resulting in death.)

a: Cardiac tamponade

Due to (or as a consequence of):

b: Ruptures myocardial infarct

Due to (or as a consequence of):

c: Atherosclerotic coronary artery disease

Due to (or as a consequence of):

d:

Part 2:

Enter other significant conditions contributing to death that did not result in the un given in Part 1.

Hypertension, Obesity, Diabetes Mellitus Type II, Tobacco,
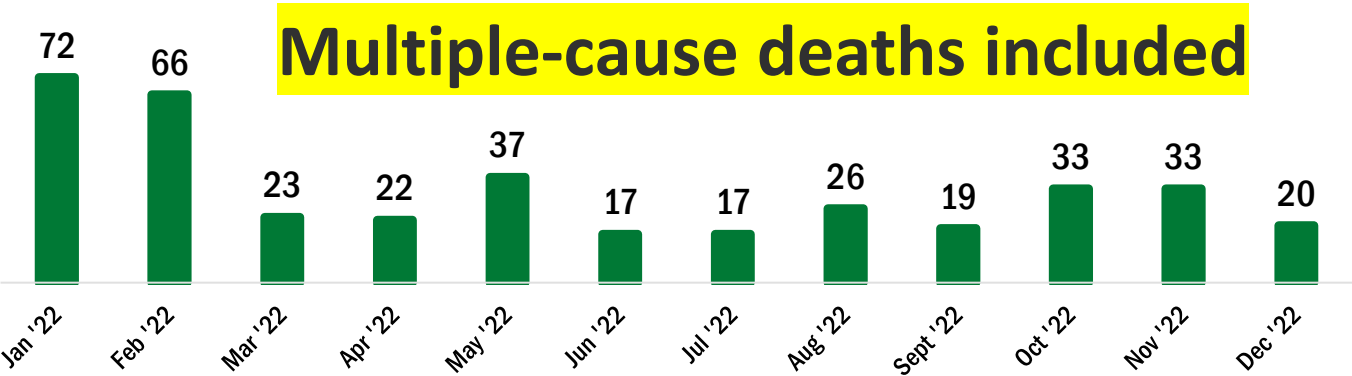COVID-19 infection

Source: Vermont Department of Health, "Certifying a Death in Vermont" training module, March 2023.

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Counting COVID-19 Deaths

2022 Monthly COVID-19 Deaths
Reported by Vermont Department of Health (Total: 315)

<mark>Multiple-cause deaths included</mark>

Month	Deaths
Jan '22	72
Feb '22	66
Mar '22	23
Apr '22	22
May '22	37
Jun '22	17
Jul '22	17
Aug '22	26
Sept '22	19
Oct '22	33
Nov '22	33
Dec '22	20

7. COVID-19
ICD-10: U071

T	238
M	149
F	89

<mark>Count of Underlying Cause (One per death)</mark>

Table C-1. 10 Leading Causes of Death among Vermont Residents, By Sex, 2000-2022.

| CAUSE OF DEATH [1]	SEX	2022 NUMBER	2022 RATE [2]	2020 RATE [2]	2010 RATE [2]	2000 RATE [2]
1. DISEASES OF THE HEART ICD-10: I00-I09, I11, I13, I20-I51	T	1590	245.7	236.4	187.0	236.4
	M	897	278.5	266.0	200.8	233.3
	F	693	213.2	207.1	173.5	239.3
2. MALIGNANT NEOPLASMS (CANCER) ICD-10: C00-C97	T	1485	229.5	217.7	223.1	203.5
	M	799	248.1	236.3	238.5	207.8
	F	686	211.1	199.4	208.2	199.4
OF TRACHEA, BRONCHUS AND LUNG ICD-10: C33-C34	T	325	50.2	47.2	64.9	54.9
	M	164	50.9	52.0	70.4	64.0
	F	161	49.5	42.4	59.5	46.1
3. ACCIDENTS ICD-10: V01-X59, Y85-Y86	T	584	90.3	75.0	47.5	38.1
	M	343	106.5	93.3	53.5	49.9
	F	241	74.1	57.0	41.6	26.7
ACCIDENTAL POISONING AND EXPOSURE TO NOXIOUS SUBSTANCES ICD-10: X40-X49	T	247	38.2	27.1	6.1	3.9
	M	168	52.2	38.2	8.4	6.7
	F	79	24.3	16.1	3.8	1.3
4. ALZHEIMER'S DISEASE ICD-10: G30	T	329	50.8	43.6	37.7	22.0
	M	109	33.8	25.3	25.0	10.7
	F	220	67.7	61.6	50.1	32.9
5. CHRONIC LOWER RESPIRATORY DISEASES ICD-10: J40-J47	T	291	45.0	53.9	53.5	50.9
	M	138	42.9	51.3	44.5	53.0
	F	153	47.1	56.4	62.4	49.0
6. CEREBROVASCULAR DISEASES (STROKE) ICD-10: I60-I69	T	261	40.3	40.9	42.5	56.5
	M	112	34.8	31.3	38.3	42.9
	F	149	45.8	50.5	46.6	69.6
	T	238	36.8	22.4	---	---
	M	149	46.3	23.2	---	---
	F	89	27.4	21.7	---	---
8. DIABETES MELLITUS ICD-10: E10-E14	T	179	27.7	23.8	24.0	26.9
	M	99	30.7	29.4	27.6	25.1
	F	80	24.6	18.3	20.5	28.7
9. INTENTIONAL SELF-HARM (SUICIDE) ICD-10: X60-X84, Y87.0	T	128	19.8	18.2	17.3	12.6
	M	96	29.8	29.7	28.2	22.8
	F	32	9.8	6.8	6.6	2.9
10. PARKINSON'S DISEASE ICD-10: G20-G21	T	105	16.2	15.4	11.2	5.6
	M	80	24.8	14.1	15.9	7.0
	F	25	7.7	16.7	6.6	4.2

Sources: Vermont Vital Statistics System; Vermont Vital Records Bulletin, 2022.

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COVID-Associated Deaths Increasingly Had Non-COVID *Underlying* Causes
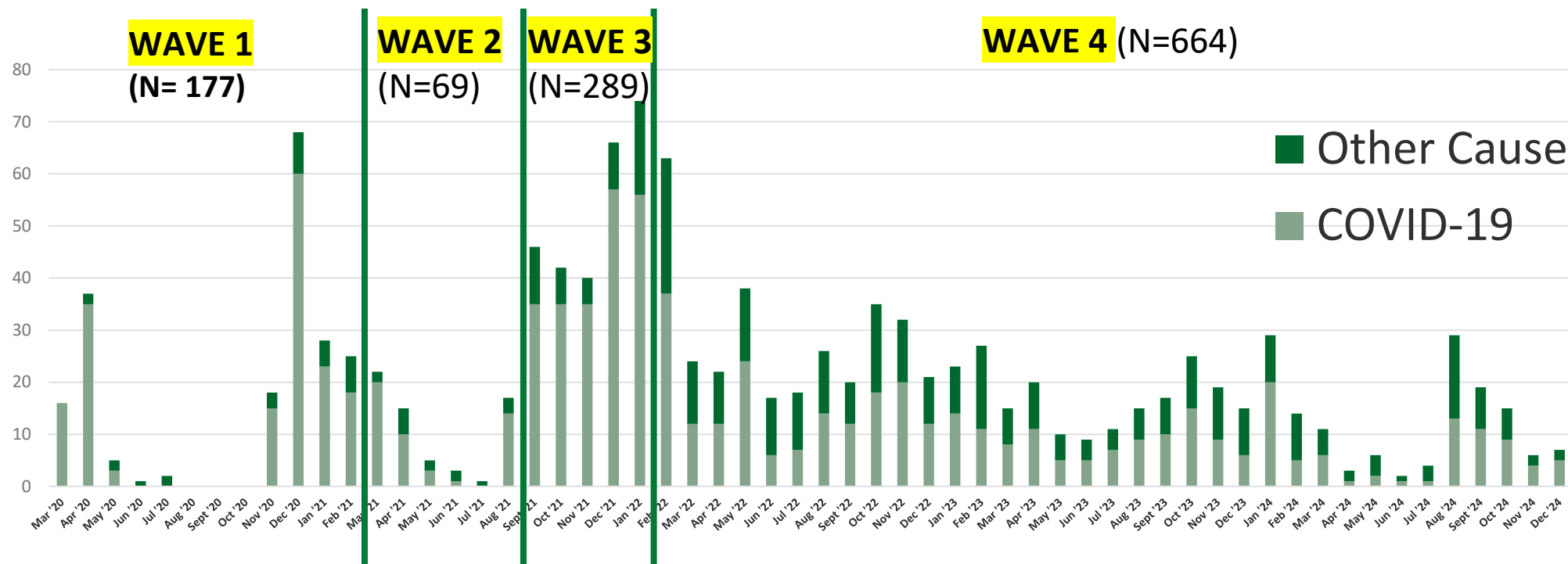
Monthly COVID-Associated Deaths, Vermont 2020-2024
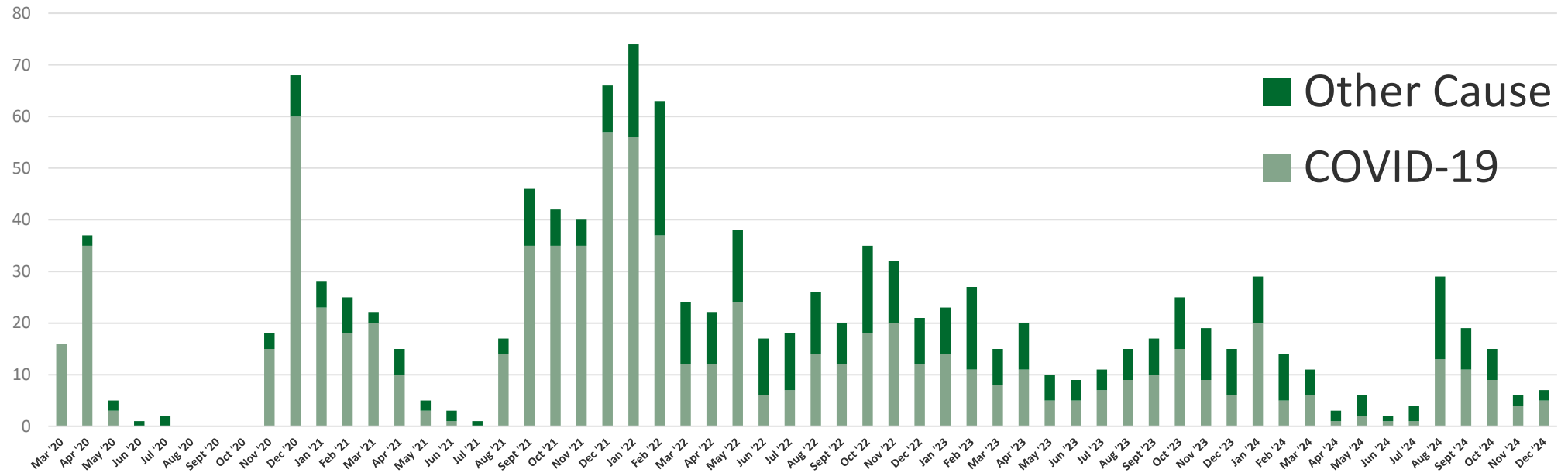
Monthly COVID-Associated Deaths, by Underlying Cause, COVID-19 or Other Cause

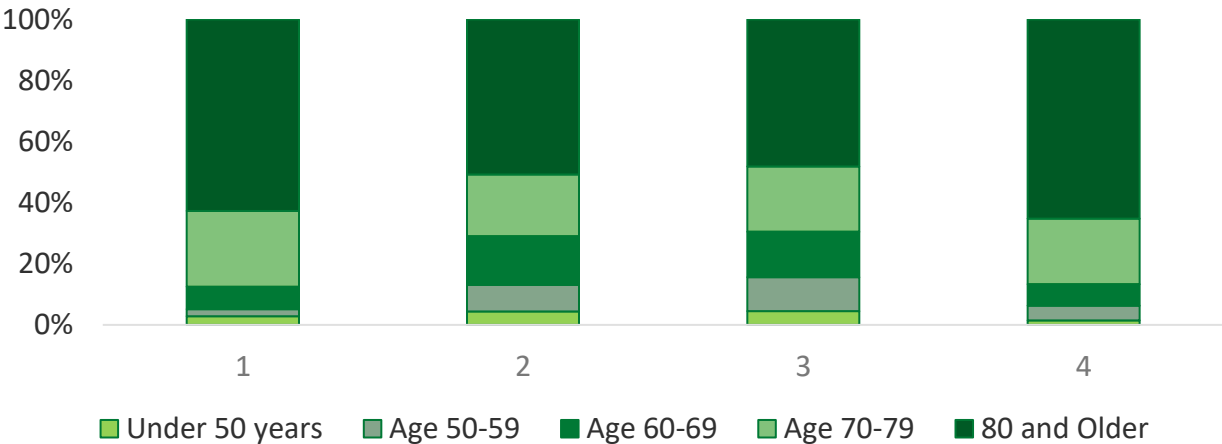(Source: Vermont Vital Statistics System):

Legend: Other Cause, COVID-19

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Waves, as Determined by Vaccination and Dominant Lineage

Monthly COVID-Associated Deaths, Vermont 2020-2024

WAVE 1 (N= 177)
WAVE 2 (N=69)
WAVE 3 (N=289)
WAVE 4 (N=664)

Other Cause
COVID-19

Monthly COVID-Associated Deaths, by Underlying Cause, COVID-19 or Other Cause (Source: Vermont Vital Statistics System):

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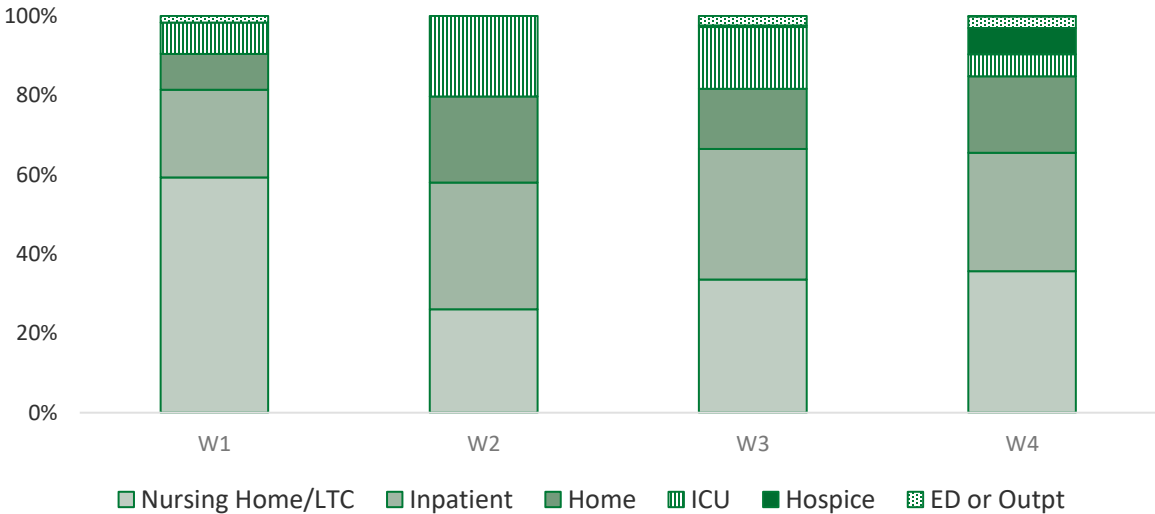Selected Characteristics, COVID-19 Associated Decedents, Vermont 2020-2024

Age of Decedent by Wave

Legend: Under 50 years, Age 50-59, Age 60-69, Age 70-79, 80 and Older

Racial/Ethnic Minority Status of Decedent By Wave

Wave 1: 2.8%
Wave 2: 4.3%
Wave 3: 2.8%
Wave 4: 1.2%

Place of Death by Wave

Legend: Nursing Home/LTC, Inpatient, Home, ICU, Hospice, ED or Outpt

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| DEATH [1]	SEX	2022 NUMBER	2022 RATE[2]	2020 RATE[2]	2010 RATE[2]
...SES OF THE HEART	T	1590	245.7	236.4	187.0
...O: I00-I09, I11, I13, I20-I51	M	897	278.5	266.0	200.8
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...GNANT NEOPLASMS (CANCER)	T	1485	229.5	217.7	223.1
...O: C00-C97	M	799	248.1	236.3	238.5
	F	686	211.1	199.4	208.2
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	F	161	49.5	42.4	59.5
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...O: V01-X59, Y85-Y86	M	343	106.5	93.3	53.5
	F	241	74.1	57.0	41.6
...DENTAL POISONING AND EXPOSURE TO NOXIOUS SUBSTANCES	T	247	38.2	27.1	6.1
...O: X40-X49	M	168	52.2	38.2	8.4
	F	79	24.3	16.1	3.8
...EIMER'S DISEASE	T	329	50.8	43.6	37.7
...O: G30	M	109	33.8	25.3	25.0
	F	220	67.7	61.6	50.1
...NIC LOWER RESPIRATORY DISEASES	T	291	45.0	53.9	53.5
...O: J40-J47	M	138	42.9	51.3	44.5
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	F	80	24.6	18.3	20.5
...TIONAL SELF-HARM (SUICIDE)	T	128	19.8	18.2	17.3
...O: X60-X84, Y87.0	M	96	29.8	29.7	28.2
	F	32	9.8	6.8	6.6
...INSON'S DISEASE	T	105	16.2	15.4	11.2
...O: G20-G21	M	80	24.8	14.1	15.9
	F	25	7.7	16.7	6.6

Patterns in **underlying cause** of COVID-19 Associated Deaths

Underlying cause: Cause listed on death record as leading to the sequence of events leading to a given death.

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Underlying Cause of Death, by Wave
Vermont COVID-19 Associated Deaths, 2020-2024

Legend:
- Other
- Fall*
- Diabetes
- Genitourinary (N00-N99)
- Stroke (I60-I64; I69)
- COPD/Chronic Lower Resp. (J40-J47)
- Alzheimer's (G30)
- Cancer (C00-C97)
- Other Dementias/Neurodegeneration (F00-F09; G10-G29; G31-G32)
- Heart Diseases (I05-I52)
- COVID-19

Wave 1, Wave 2, Wave 3, Wave 4

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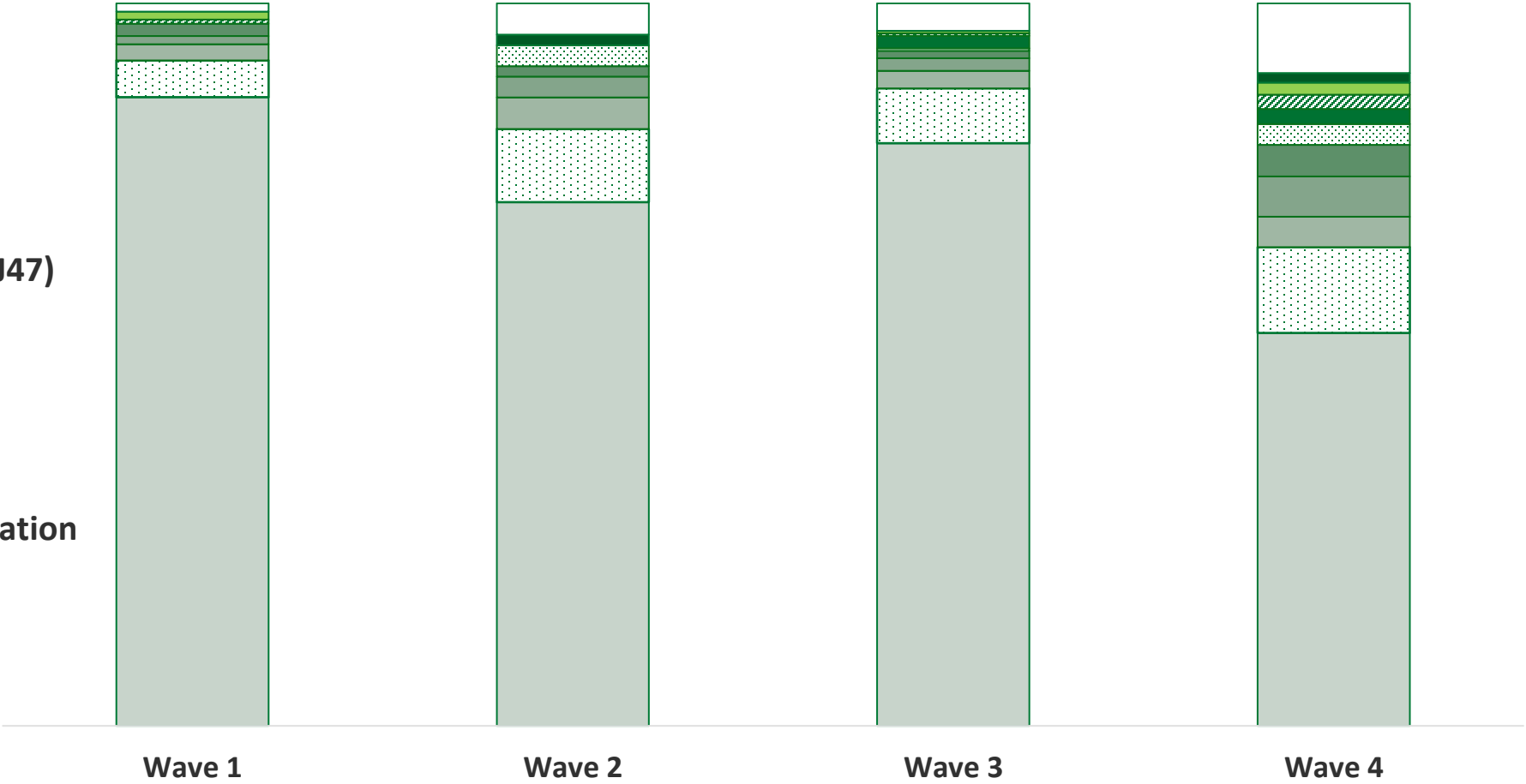
In Wave 4, COVID was the underlying cause for under half of COVID-associated deaths for decedents under age 65, and a significantly lower proportion of age 65+ deaths than previous waves.

COVID-Associated Deaths with COVID-19 as Underlying Cause
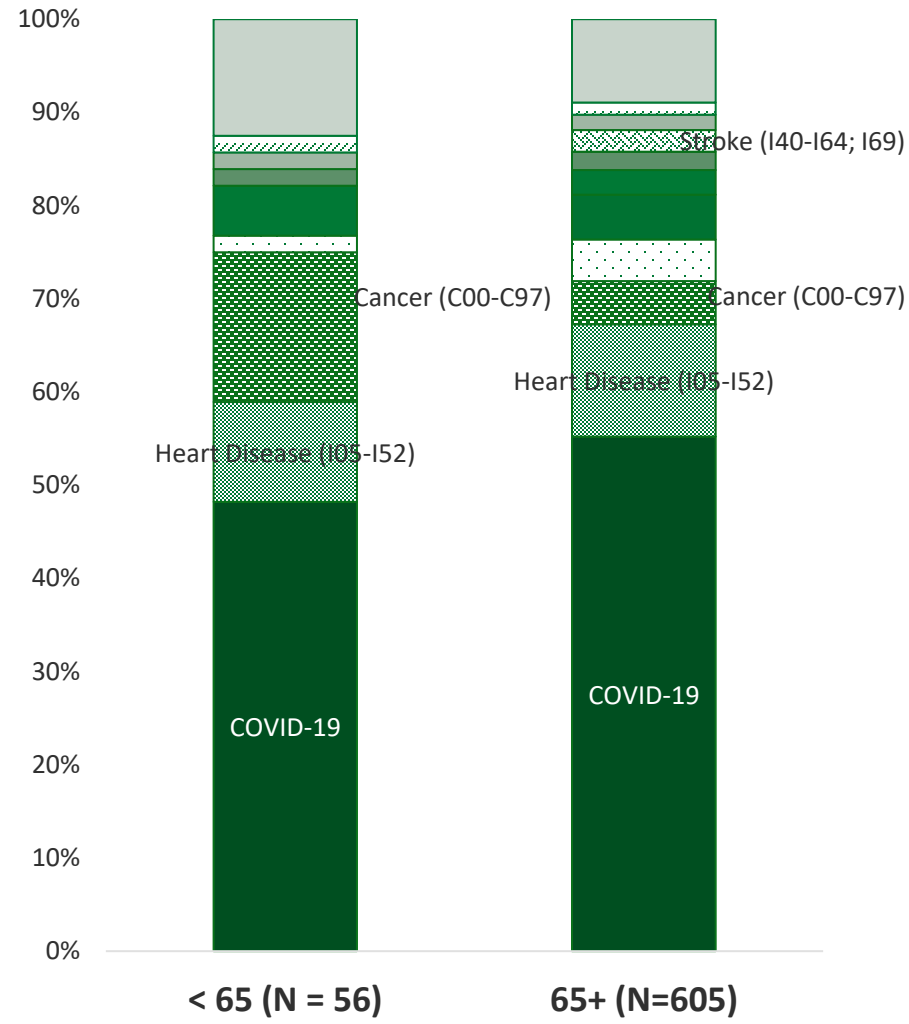### Vermont 2020-2024, by Age

Legend: ■ <65 ■ 65+

Wave 1: N=13, N=164
Wave 2: N=13, N=56
Wave 3: N=65, N=224
Wave 4: N=59, N=605
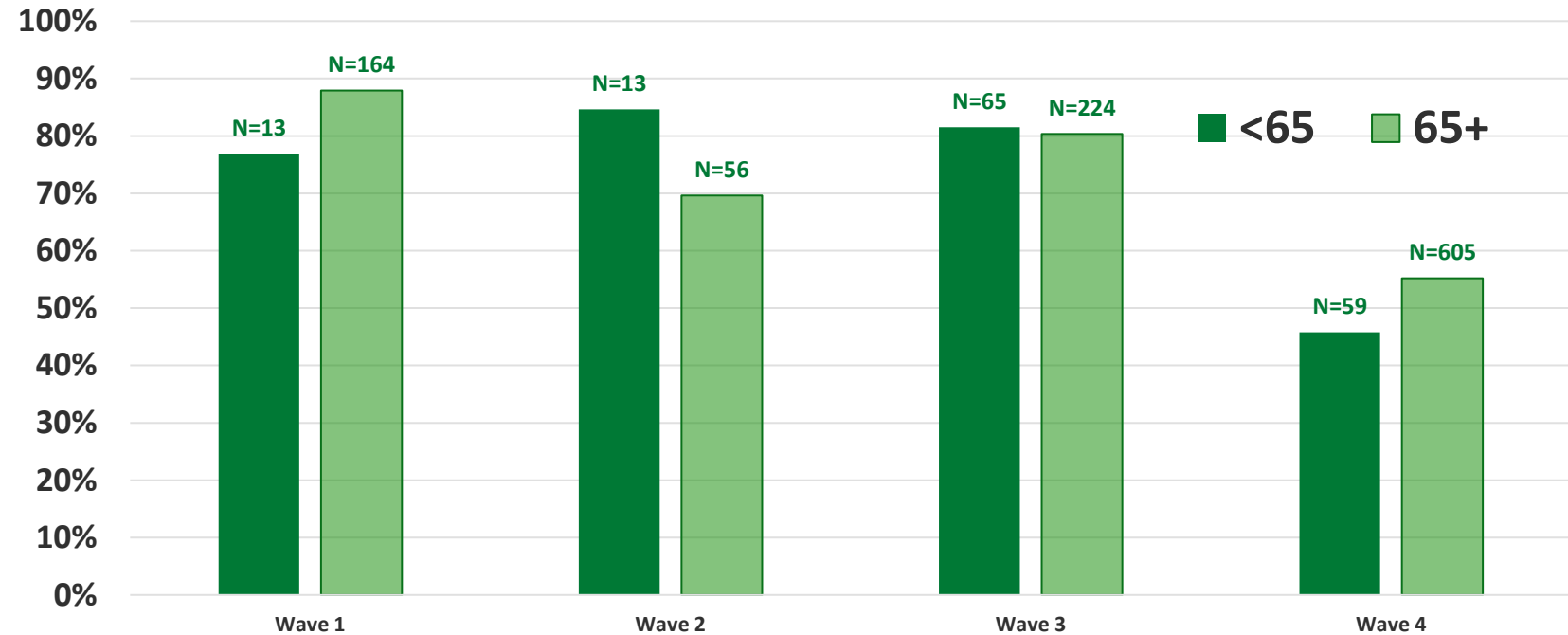
About half of the COVID-19 deaths reported to the public in Wave 4 had a non-COVID underlying cause, though COVID was listed as a contributing cause on each death record so reported.

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Compared to preceding waves:

Other leading *underlying* causes of death (particularly heart disease, cancer, stroke, and, among age 65+, Alzheimer's and other dementia) were more common among both age groups in **Wave 4**.

Legend:
- Other
- Falls*
- Diabetes
- **Stroke (I40-I64; I69)**
- Genitourinary (N00-N99)
- COPD/Chronic Lower Resp. (J40-J47)
- **Alzheimer's (G30)**
- **Other Dementias/Neurodegeneration (F00-F09; G20-G29; G31-G32)**
- **Cancer (C00-C97)**
- **Heart Disease (I05-I52)**
- COVID-19

Chart labels: Stroke (I40-I64; I69), Cancer (C00-C97), Heart Disease (I05-I52), COVID-19
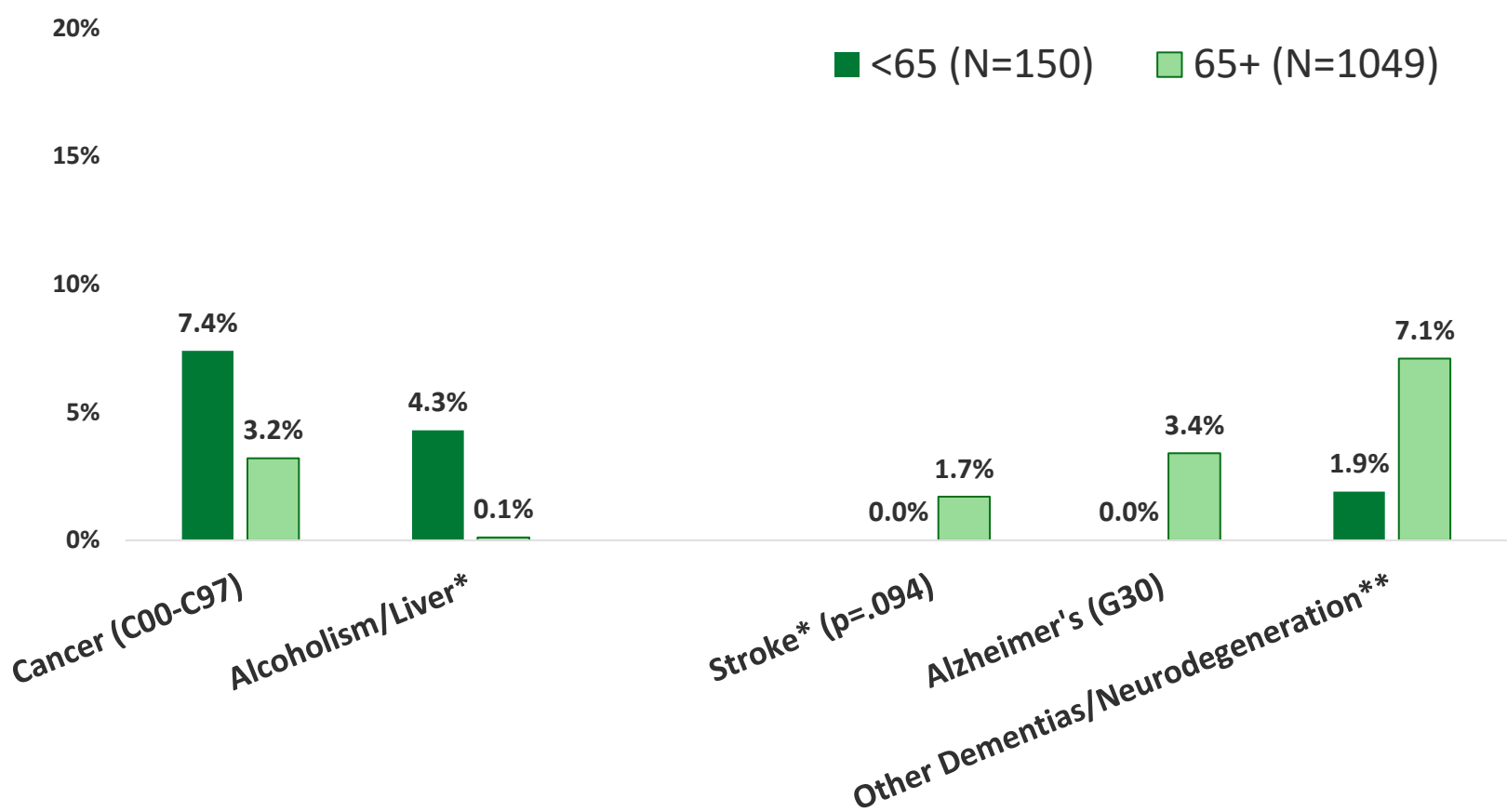
X-axis: < 65 (N = 56), 65+ (N=605)

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COVID-19 Associated Deaths, Vermont 2020-2024

Across **all waves**:

Cancer and alcoholism/liver disease were more common **underlying** causes of death among decedents **under age 65**.

Among those **65 and older**, **Alzheimer's** and **other dementias/neurodegenerative diseases** were more common as **underlying** cause of death.

■ <65 (N=150)   □ 65+ (N=1049)

Cause	<65	65+
Cancer (C00-C97)	7.4%	3.2%
Alcoholism/Liver*	4.3%	0.1%
Stroke* (p=.094)	0.0%	1.7%
Alzheimer's (G30)	0.0%	3.4%
Other Dementias/Neurodegeneration**	1.9%	7.1%

*   K70-K77; K292; F10; G62.1; G72.1; X45, X65, Y15; I426.
**   F00-F09; G10-G29; G31-G32.

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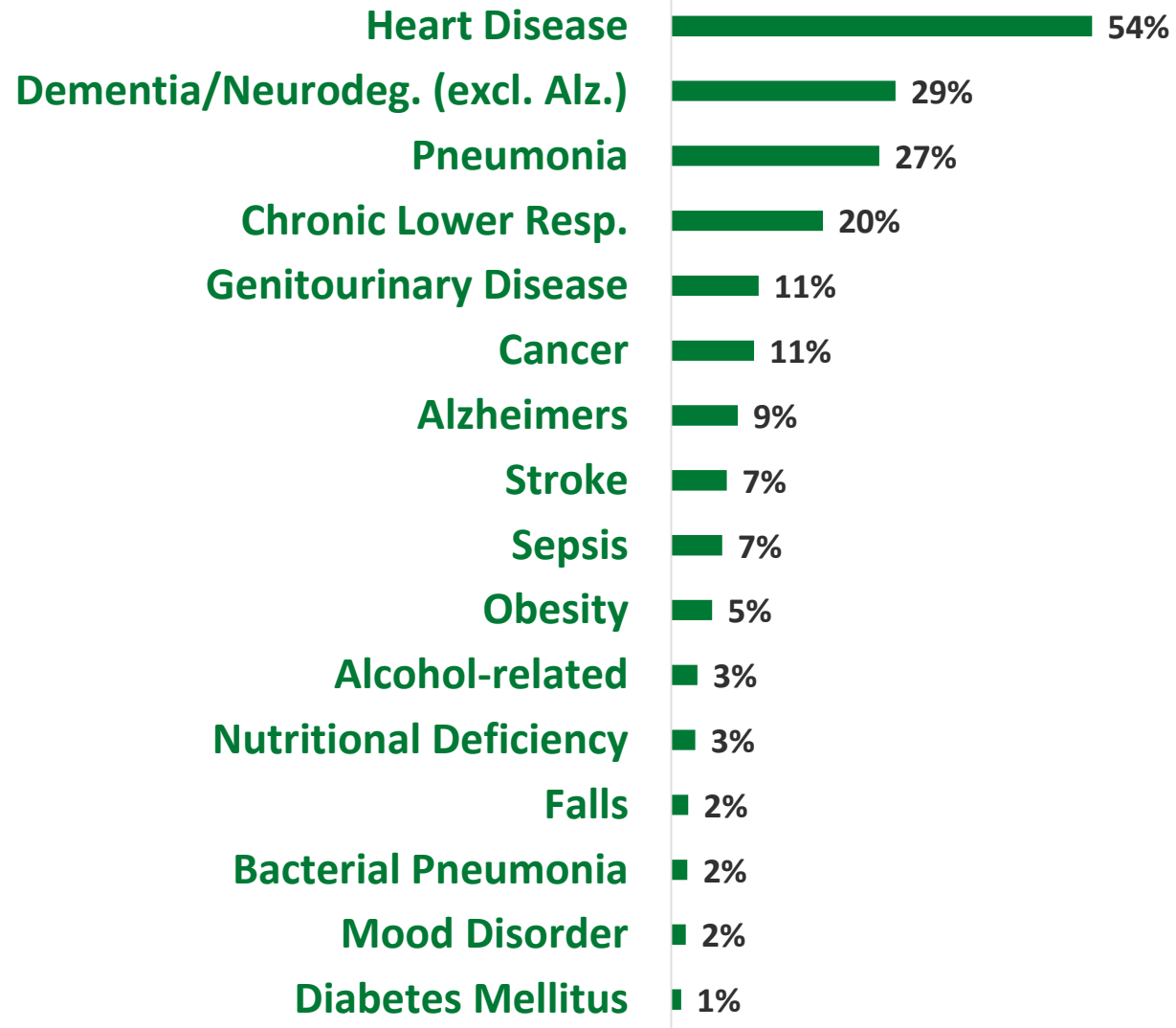# Patterns in COVID-19 Associated Deaths, **Multiple-Cause** Analysis:

All **underlying**, **immediate** and **contributing** causes

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**Prevalence of all causes to COVID-Associated Deaths*, Vermont 2020-2024**

*2023-2024 counts provisional

Cause	Percentage
Heart Disease	54%
Dementia/Neurodeg. (excl. Alz.)	29%
Pneumonia	27%
Chronic Lower Resp.	20%
Genitourinary Disease	11%
Cancer	11%
Alzheimers	9%
Stroke	7%
Sepsis	7%
Obesity	5%
Alcohol-related	3%
Nutritional Deficiency	3%
Falls	2%
Bacterial Pneumonia	2%
Mood Disorder	2%
Diabetes Mellitus	1%

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Causes that were significantly more frequent after Wave 1

Heart disease was more common among decedents age 65+ but was also the most common other cause for younger decedents, and most common in or outside of NH/LTC.

COVID deaths to which **bacterial pneumonia**, **cancer** or **genitourinary diseases** contributed were more likely outside of NHs/LTCs.
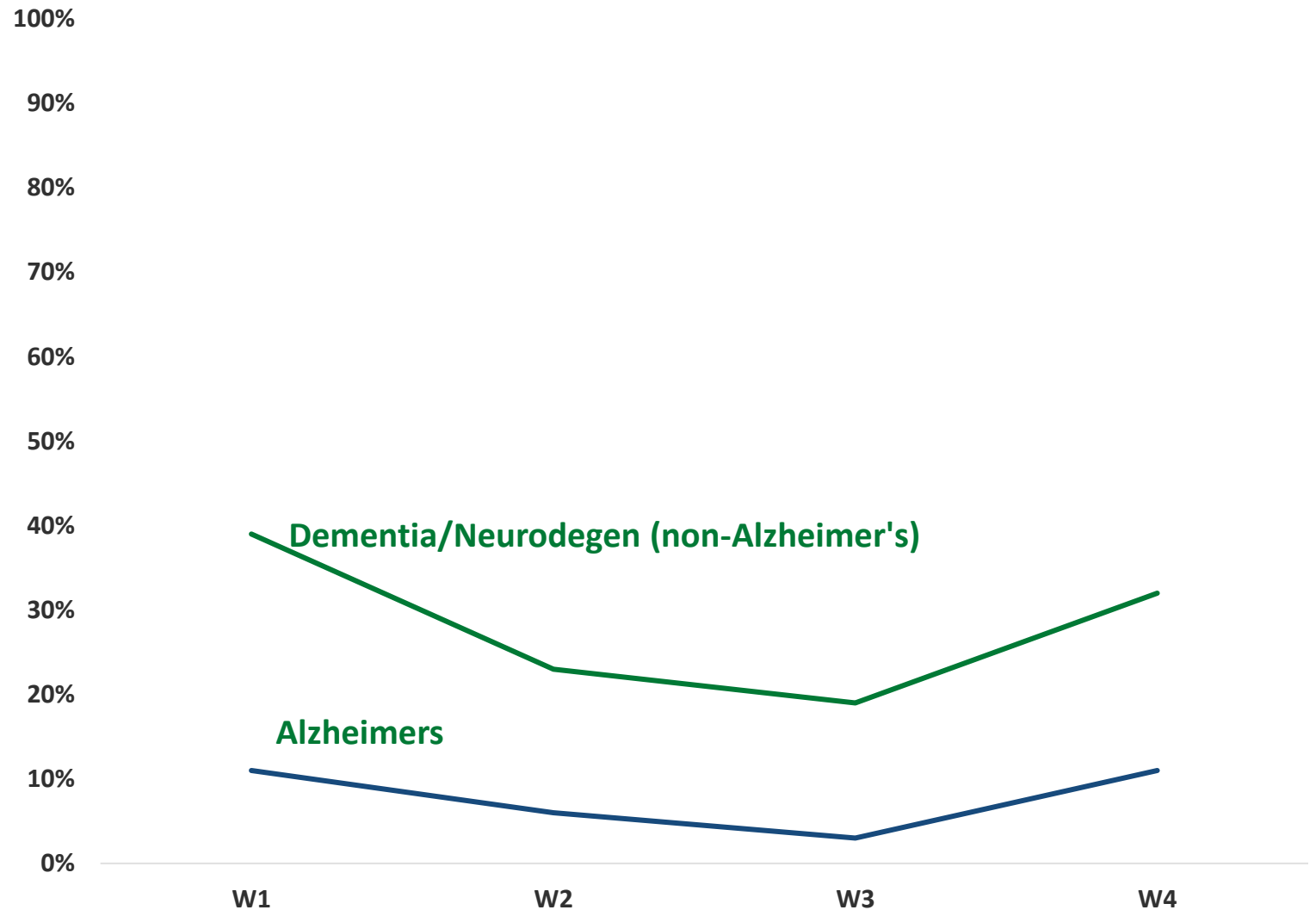
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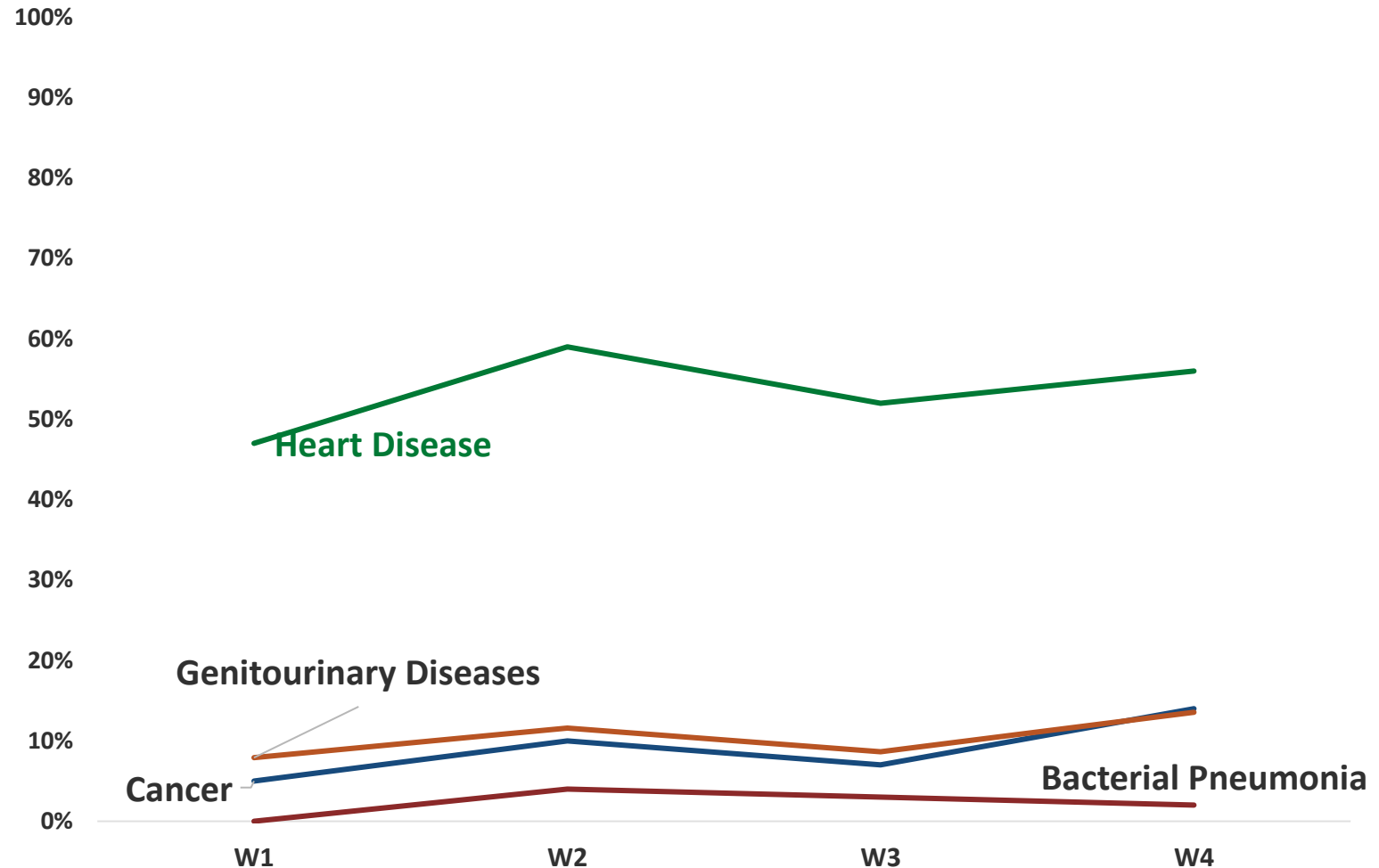
All causes that were significantly higher in a middle wave than waves 1 & 4 were more common among COVID decedents under 65.

Pneumonia- and obesity-related COVID deaths were more likely to occur outside of a NH/LTC; no POD pattern for **alcohol-related** COVID deaths.
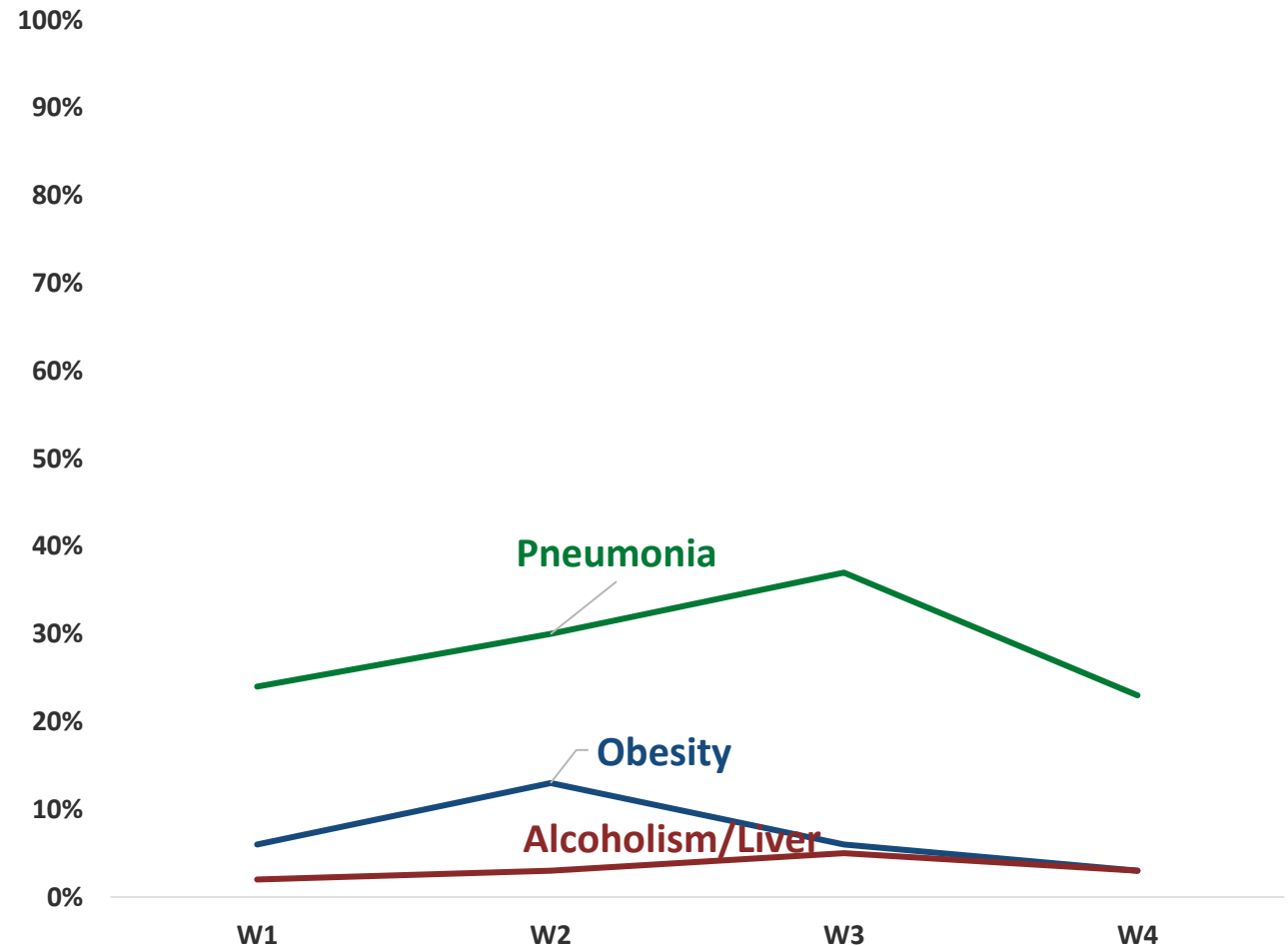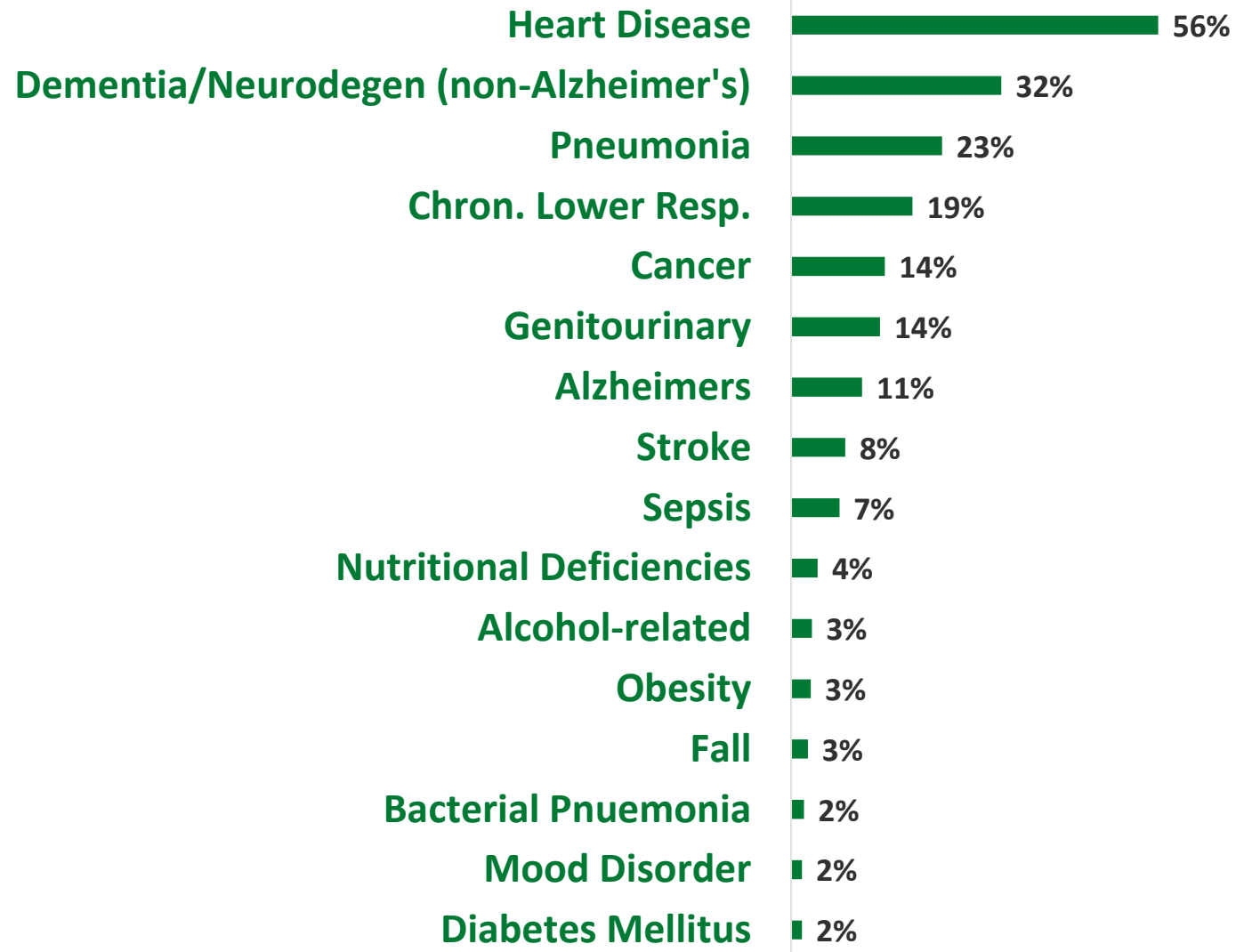
COVID deaths associated with Alzheimer's and other dementias & neurodegenerative diseases were significantly higher in Waves 1 and 4 than the middle waves and significantly more frequent among decedents age 65+ and in NH/LTCs

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Limitations

Things to keep in mind with this data:

- Death records are legal, not epidemiological research, documents.

- Research has identified inconsistencies in how death records are completed across individuals, professions and jurisdictions.

- Analysis did not factor onset timing of conditions (e.g., whether a heart condition or COVID infection happened first).

- Death counts 2023-2024 are provisional.

- Statistical analyses here are only within the set of COVID-associated deaths, and not overall deaths or overall population.

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Conclusions

What should the public understand about COVID-19 deaths?

- Through the end of 2024, COVID-19 was still the underlying cause of around half of COVID-19 associated deaths in Vermont.

- While other leading causes of death were increasingly likely to be the underlying cause, COVID-19 continued to lead to many deaths, even in individuals under 65.

- Heart disease contributed to over half of Vermont COVID-associated deaths from 2020-2024.

- Cancers or any dementia/neurodegenerative disease contributed to just under half (46%) of W4 COVID deaths.

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Conclusions

How did COVID-19 mortality change between 2020-2024?

- **Non-linearly: Age distributions were more similar for Waves 1 and 4 than intervening waves, while underlying cause of death differed most greatly for Wave 4.**

- **First broader community spread (waves 2-3) associated with younger COVID-19 death distribution than was seen initially (NH-focused early pandemic) or following the rise of Omicron.**

- **Among COVID-19 associated deaths, other common causes of death increased, particularly in the latest phase of this analysis.**

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Follow-up & Next Steps

Can other death record fields, such as demographic information and time interval, be productively analyzed?

- What age patterns for COVID-19 mortality emerge when looking at death rates, versus solely COVID-19 mortality counts?

Should epidemiologists look closer at mortality in other common respiratory infectious diseases?

- Could this productively educate the public about risk factors and encourage greater attention to respiratory virus prevention?

Data Issues in COVID-19 Death Records:

- Overall and proportionally, very few data issues were evident in reviewing 2020-2024 COVID-19 death records.

- Twenty-three COVID-19 associated deaths had an "accidental" or undetermined cause of death.

- In reviewing Cause of Death text fields, five were included that stated e.g., "COVID test negative."

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Acknowledgements

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Minnesota Department of Health: Lydia Fess

Vermont providers and funeral directors who certify deaths

Unless otherwise stated, all data are from the Vermont Vital Statistics System. All death counts 2023-2024 are provisional.

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