# Alcohol and cancer

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# Conflicts of interest

- None

# Overview

1 Cancers associated with alcohol consumption

2 Possible mechanisms of the association between alcohol consumption and cancer

3 Cancer cases and deaths attributable to alcohol consumption

4 Alcohol reduction or cessation and cancer risk

5 Evidence gaps

6 Conclusions

# Cancers associated with alcohol consumption

- Standard drink in the U.S.
  - 1 Drink = 14 grams of pure ethanol




Figure from the Centers for Disease Control and Prevention. Alcohol use and your health. https://www.cdc.gov/alcohol/fact-sheets/alcohol-use.htm

# Cancers associated with alcohol consumption

| Cancer | International Agency for Research on Cancer | World Cancer Research Fund |
|---|---|---|
| **Oral cavity** | Sufficient evidence | Strong (convincing) |
| **Pharynx** | Sufficient evidence | Strong (convincing) |
| **Larynx** | Sufficient evidence | Strong (convincing) |
| **Esophagus** | Sufficient evidence | |
| **Esophagus (Squamous cell carcinoma)** | | Strong (convincing) |
| **Colorectum** | Sufficient evidence | Strong (convincing), >30g/d |
| **Liver** | | Strong (convincing), >45g/d |
| **Hepatocellular carcinoma** | Sufficient evidence | |
| **Breast (female)** | Sufficient evidence | |
| **Premenopausal** | | Strong (convincing) |
| **Postmenopausal** | | Strong (probable) |
| **Stomach** | — | Strong (probable), >45g/d |



IARC Monographs on the Evaluation of Carcinogenic Risks to Humans Volume 100E. Personal habits and indoor combustions. 2012.
World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

## Strength of evidence

- **IARC, sufficient evidence**: A causal association has been established. A positive association has been observed in the body of evidence on exposure to the agent and cancer in studies in which chance, bias, and confounding were ruled out with reasonable confidence.
- **WCRF, strong (convincing)**: Evidence strong enough to support a judgement of a convincing causal relationship, which justifies goals and recommendations designed to reduce the incidence of cancer. The evidence is robust enough to be highly unlikely to be modified in the foreseeable future as new evidence accumulates.
- **WCRF, strong (probable)**: Evidence strong enough to support a judgement of a probable causal relationship, which generally justifies recommendations designed to reduce the incidence of cancer.



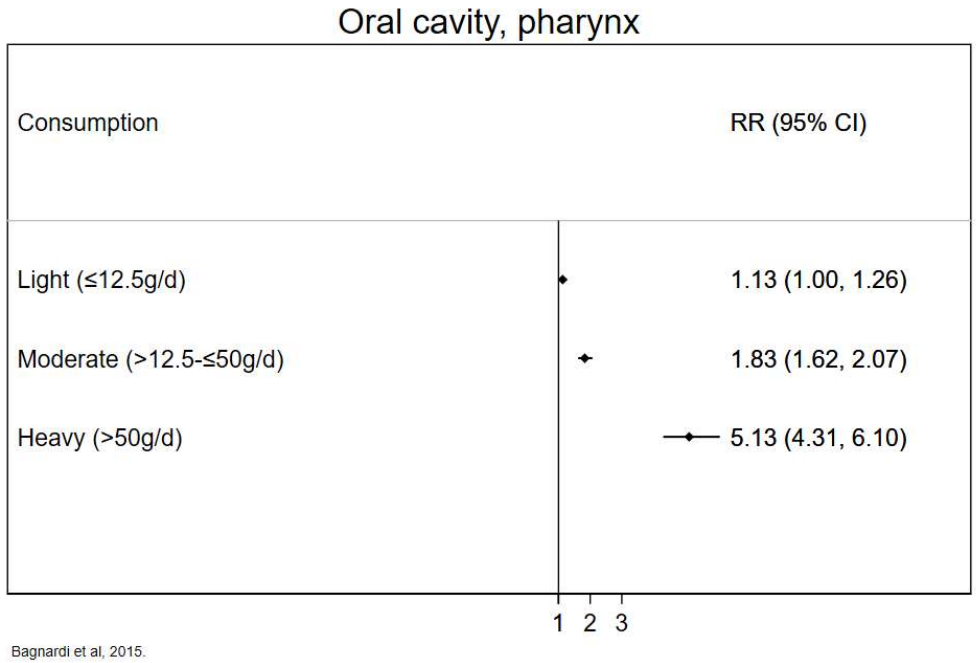
IARC Monographs on the Evaluation of Carcinogenic Risks to Humans Volume 100E. Personal habits and indoor combustions. 2012.
World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

- Oral cavity

Oral cavity

| Region | RR (95% CI) per 10g/d |
|---|---|
| World | 1.15 (1.09, 1.22) |
| North America | Not reported |

WCRF/AICR, 2018.




Bagnardi et al, 2015.



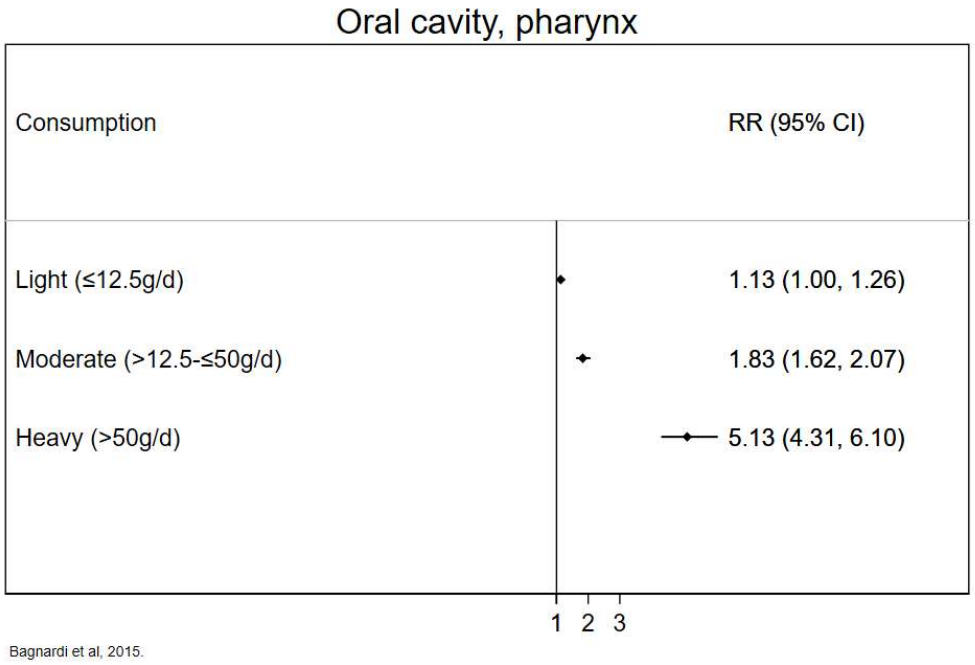
Bagnardi et al. Alcohol consumption and site-specific cancer risk: a comprehensive dose-response meta-analysis. *Br J Cancer*. 2015;112(3):580-93.
World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

- Pharynx

Pharynx

| Region | RR (95% CI) per 10g/d |
|---|---|
| World | 1.13 (1.05, 1.21) |
| North America | Not reported |

WCRF/AICR, 2018.

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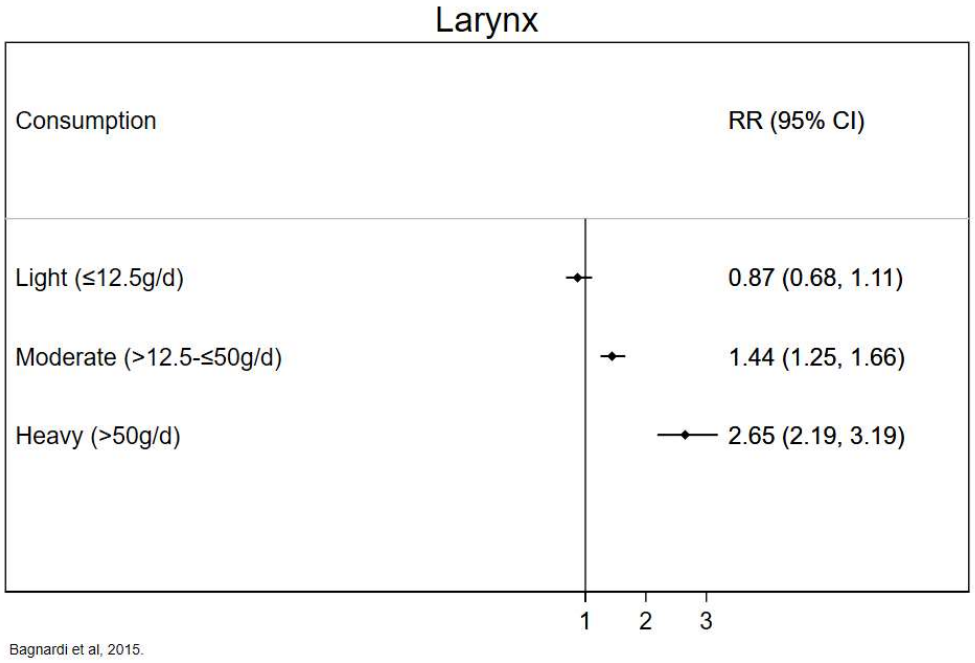
World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

- Larynx

Larynx

| Region | RR (95% CI) per 10g/d |
|---|---|
| World | 1.09 (1.05, 1.13) |
| North America | Not reported |

WCRF/AICR, 2018.




Bagnardi et al, 2015.



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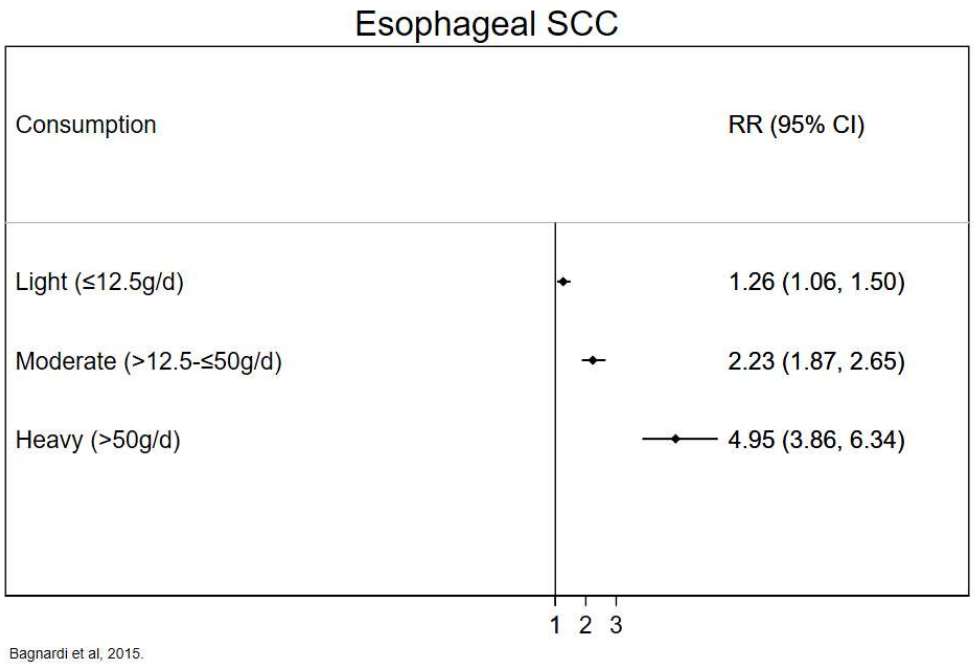
World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

- Esophagus (squamous cell carcinoma)

Esophagus SCC

| Region | RR (95% CI) per 10g/d |
|---|---|
| World | 1.25 (1.12, 1.41) |
| North America | 1.26 (1.12, 1.41) |

WCRF/AICR, 2018.



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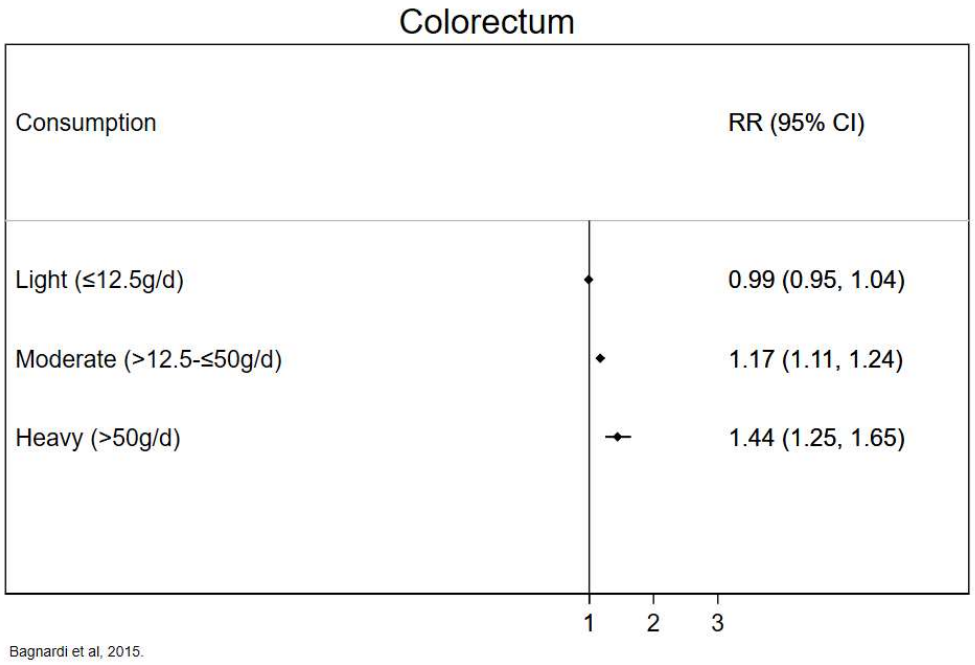
World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

- Colorectum

Colorectum (for consumption >30g/d)

| Region | RR (95% CI) per 10g/d |
|---|---|
| World | 1.07 (1.05, 1.08) |
| North America | 1.06 (1.01, 1.12) |

WCRF/AICR, 2018.

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World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

- Colorectum

RR (95% CI) for the association between alcohol consumption and colorectal cancer risk in a pooled analysis of 2 U.S. cohort studies (Nurses' Health Study and Health Professionals Follow-up Study)

| Consumption | Men | Women |
|---|---|---|
| 0 g/d | Reference | Reference |
| 0.1-4.9 | 0.99 (0.82, 1.20) | 1.09 (0.96 to 1.24) |
| 5-14.9 | 1.15 (0.96, 1.39) | 1.07 (0.91 to 1.24) |
| 15-29.9 | 1.32 (1.08, 1.63) | 1.08 (0.89 to 1.32) |
| 30-44.9 | 1.59 (1.25, 2.03) | 1.39 (1.06 to 1.83) |
| ≥45 g/d | 1.46 (1.07, 1.99) | 1.46 (0.91 to 2.34) |
| p for trend | <0.001 | <0.001 |

Adjusted for age, race, height, body mass index, family history of cancer, physical exam in past two years, history of colonoscopy or sigmoidoscopy, smoking in pack years, physical activity, regular aspirin use, multivitamin use, total energy intake (without alcohol), red and processed meat intake, alternate healthy eating index 2010 (without alcohol); prostate specific antigen test in past two years (men only); and menopause status, postmenopausal hormone use, and mammogram in past two years (women only).



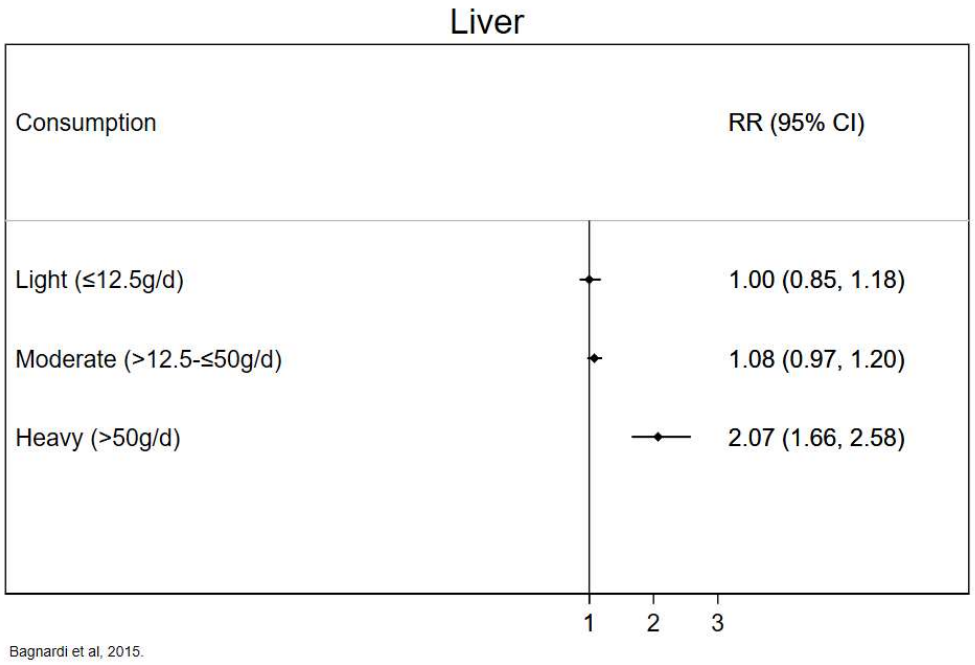
Cao et al. Light to moderate intake of alcohol, drinking patterns, and risk of cancer: results from two prospective US cohort studies. *BMJ*. 2015;351:h4238.

- Liver

Liver (for consumption >45g/d)

| Region | RR (95% CI) per 10g/d |
|---|---|
| World | 1.04 (1.02, 1.06) |
| North America & Europe | 1.08 (1.00, 1.16) |

WCRF/AICR, 2018.

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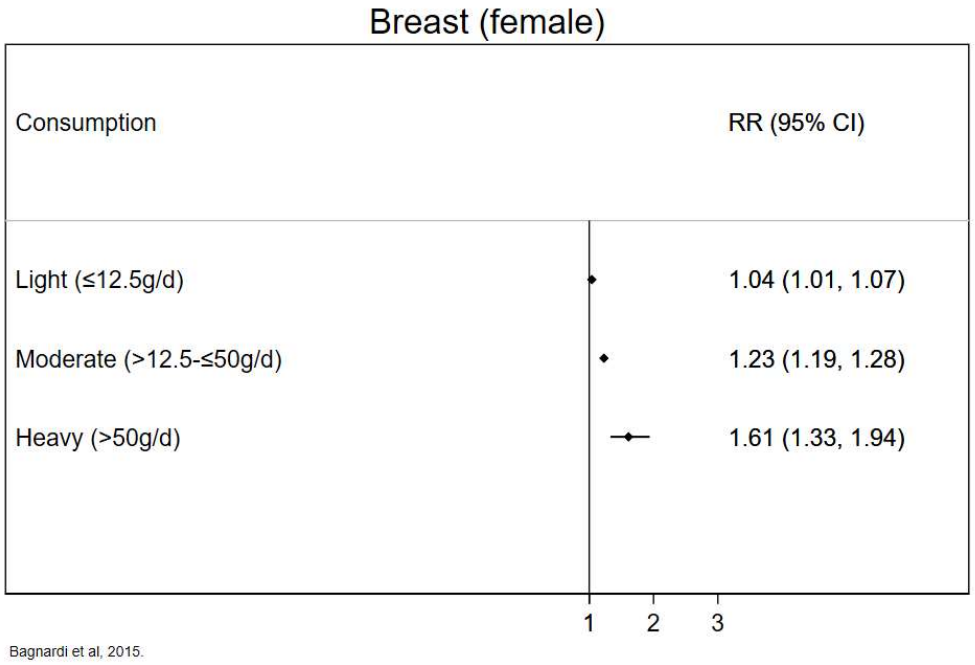
World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

- Breast (female)

Breast (female)

| Region | RR (95% CI) per 10g/d |
|---|---|
| ***Premenopausal*** | |
| World | 1.05 (1.02, 1.08) |
| North America | 1.07 (1.02, 1.12) |
| ***Postmenopausal*** | |
| World | 1.09 (1.07, 1.12) |
| North America | 1.11 (1.07, 1.15) |

WCRF/AICR, 2018.

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World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

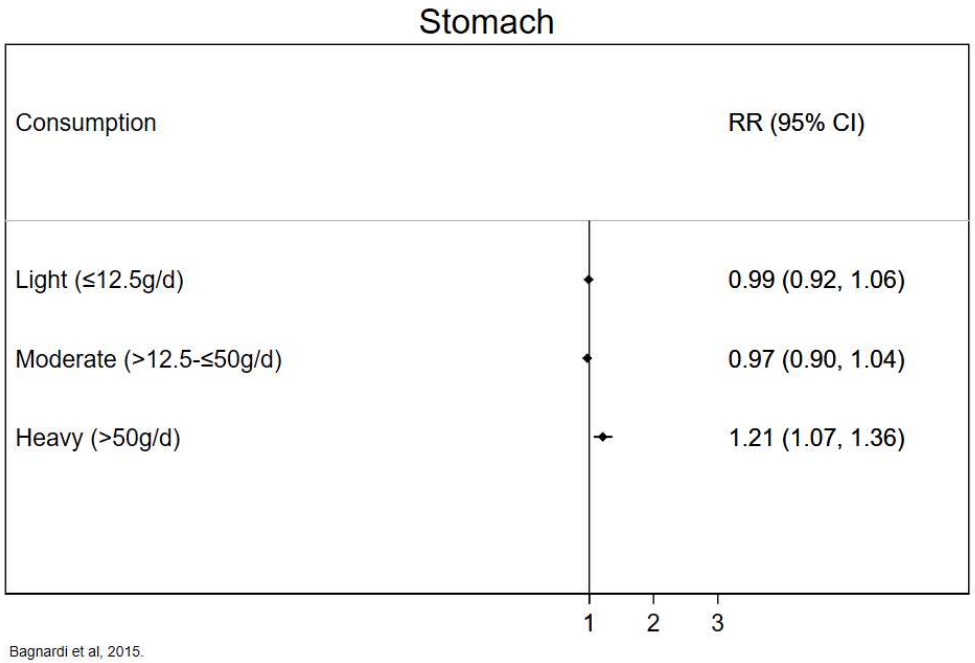
- Stomach (only based on WCRF evaluation)

Stomach (for consumption >45g/d)

| Region | RR (95% CI) per 10g/d |
|---|---|
| World | 1.02 (1.00, 1.04) |
| North America | 0.82 (0.52, 1.29) |

WCRF/AICR

In WCRF evaluation, not in studies from North America and Europe.




Bagnardi et al, 2015.



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World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

# The magnitude of associations, per 10g pure ethanol/day (WCRF report)

| Cancer | Relative risk (95% CI) |
|---|---|
| **Oral cavity** | 1.15 (1.09, 1.22) |
| **Pharynx** | 1.13 (1.05, 1.21) |
| **Larynx** | 1.09 (1.05, 1.13) |
| **Esophagus** (Squamous cell carcinoma) | 1.25 (1.12, 1.41) |
| **Colorectum** (starting from ~ 2 drinks/day per WCRF) | 1.07 (1.05, 1.08) |
| **Liver** (hepatocellular carcinoma) (starting from ~ 3 drinks/day per WCRF) | 1.04 (1.02, 1.06) |
| **Breast (female)** Premenopausal | 1.05 (1.02, 1.08) |
| Postmenopausal | 1.09 (1.07, 1.12) |
| **Stomach** (starting from ~ 3 drinks/day per WCRF) * | 1.02 (1.00, 1.04) |

* Only based on WCRF evaluation, in which the excess risk was not reported in studies from North America and Europe.



World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

- Alcohol increases cancer risk
  - all types of alcoholic beverages can cause cancer

Association between alcoholic beverages and colorectal cancer risk

| Alcoholic beverage | RR (95% CI) per 10g/d |
|---|---|
| Beer | 1.08 (1.05, 1.11) |
| Wine | 1.04 (1.01, 1.08) |
| Spirits | 1.08 (1.02, 1.14) |

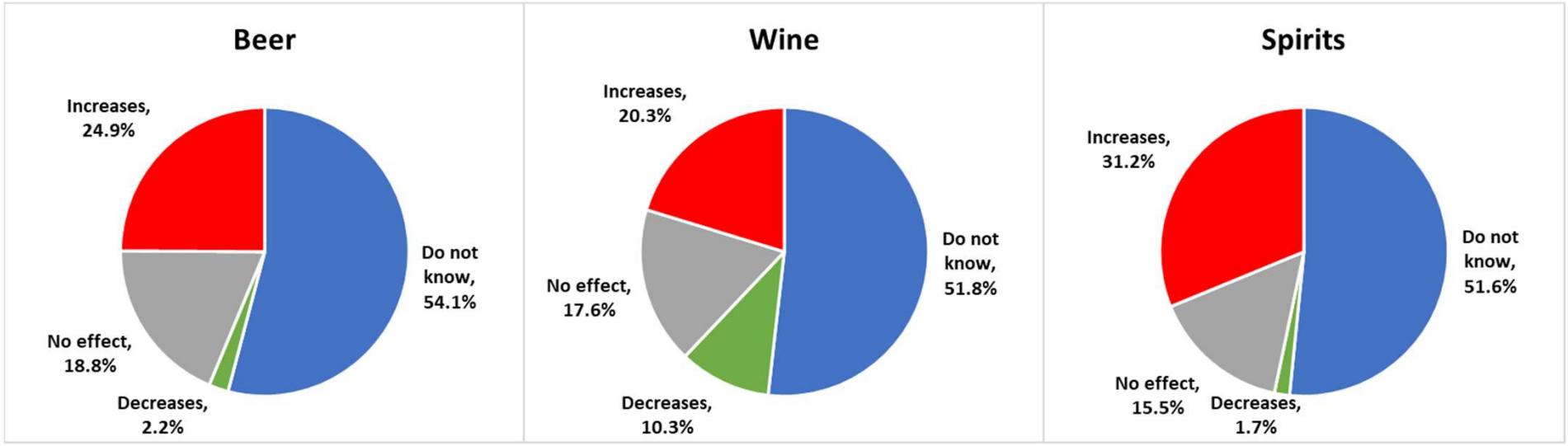
WCRF/AICR, 2018.



World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR). Continuous Update Project Expert Report 2018. Alcoholic drinks and cancer risk.

- Awareness about alcohol and cancer risk

U.S. adults' beliefs about how wine, beer, and liquor consumption affect cancer risk, 2020






Seidenberg et al. Do beliefs about alcohol and cancer risk vary by alcoholic beverage type and heart disease risk beliefs? *CEBP*. 2023;32:46-53.

# Possible mechanisms

- International Agency for Research on Cancer:
  - consumption of alcohol is carcinogenic to humans (Group 1)
  - ethanol in alcoholic beverages is carcinogenic to humans (Group 1)
  - acetaldehyde associated with the consumption of alcoholic beverages is carcinogenic to humans (Group 1)



IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: vol 44 (1987), vol 96 (2000), and vol 100E (2012).

- Acetaldehyde: a major determinant of alcohol-related carcinogenesis
    - DNA damage
        - DNA adducts
        - mutations
        - chromosomal aberrations
        - sister chromatid exchange
        - micronucleus formation
    - Other adverse effects



Gapstur et al. The IARC perspective on alcohol reduction or cessation and cancer risk. *N Engl J Med*. 2023;389:2486-2494.


Alcohol dehydrogenase (ADH)
Aldehyde dehydrogenase (ALDH)
Ethanol
Acetaldehyde
Acetate

# Inside the gastrointestinal tract


- Ethanol → acetaldehyde, catalyzed by microbial ADH locally (high concentration up to 15-20 minutes after ingestion)

+

- Low ALDH activities of oral/gut microbiome and mucosa

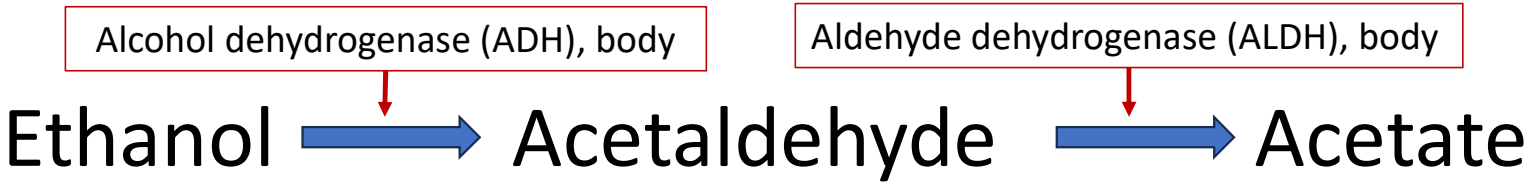
↓

Accumulation of acetaldehyde in saliva, gastric juice, and colonic contents



Gapstur et al. The IARC perspective on alcohol reduction or cessation and cancer risk. *N Engl J Med*. 2023;389:2486-2494.

# After absorption by the body




- Distribution of ethanol in body within 30 minutes after ingestion

↓

High concentration of acetaldehyde in body until ethanol is eliminated

- Depends on amount of alcohol ingested
- Also affected by smoking and body's ALDH activity



Gapstur et al. The IARC perspective on alcohol reduction or cessation and cancer risk. *N Engl J Med*. 2023;389:2486-2494.

- Interaction between alcohol and smoking

- Continuous smoking + heavy alcohol consumption → changes in oral microbial flora, especially in high acetaldehyde producing strains
- Other mechanisms?
- After alcohol drinking, salivary acetaldehyde levels during concomitant smoking are several times higher than levels in nonsmoking individuals



Gapstur et al. The IARC perspective on alcohol reduction or cessation and cancer risk. *N Engl J Med*. 2023;389:2486-2494.

- Interaction between alcohol and smoking

Joint effect of smoking and alcohol on head and neck cancer risk

| Smoking | Alcohol | Odds ratio (95% CI) |
|---|---|---|
| Never | Never | Reference |
| 1-20 cigs/day | Never | 2.20 (1.57, 3.09) |
| >20 cigs/day | Never | 4.15 (2.44, 7.07) |
| Never | 1-2 drinks/day | 1.03 (0.84, 1.25) |
| 1-20 cigs/day | 1-2 drinks/day | 3.09 (2.13, 4.50) |
| >20 cigs/day | 1-2 drinks/day | 4.81 (3.21, 7.20) |
| Never | ≥3drinks/day | 1.91 (1.27, 2.87) |
| 1-20 cigs/day | ≥3drinks/day | 9.92 (6.36, 15.46) |
| >20 cigs/day | ≥3drinks/day | 14.23 (8.30, 24.40) |

***P* for interaction <0.01**. A pooled analysis of 18 case-control studies with 11,211 cases and 16,152 controls. . Adjusted for age, sex, education, race/ethnicity, and study center.



Hashibe et al. Interaction between tobacco and alcohol use and the risk of head and neck cancer: Pooled analysis in the International Head and Neck Cancer Epidemiology Consortium. *CEBP*. 2009;18(2):541-550.

- Interaction between alcohol and genetic factors


# • Interaction between alcohol and genetic factors

Association between polymorphism in ALDH2 and esophageal squamous cell carcinoma risk

*2 denotes low activity ALDH2 allele (slower metabolism of acetaldehyde)

| Alcohol intake | Cases/controls | Odds ratio (95% CI) |
|---|---|---|
| ***1/*1** | | |
| Non-drinker | 17/191 | **Reference** |
| 0.1-30 g/d | 45/103 | 2.2 (1.1, 4.5) |
| >30 g/d | 49/31 | 7.2 (3.3, 15.9) |
| ***1/*2** | | |
| Non-drinker | 38/236 | 1.1 (0.6–2.3) |
| 0.1-30 g/d | 114/42 | 14.5 (7.1–29.6) |
| >30 g/d | 129/8 | 102.6 (38.3–274.8) |
| ***2/*2** | | |
| Non-drinker | 8/44 | 1.2 (0.4–3.4) |
| 0.1-30 g/d | 3/1 | 17.3 (1.4–213.7) |
| >30 g/d | 3/0 | – |

Adjusted for age, sex, study hospital, ethnicity, smoking, education, smoking, betel quid chewing, and consumption of fruits and vegetables.



Lee et al. Carcinogenetic impact of ADH1B and ALDH2 genes on squamous cell carcinoma risk of the esophagus with regard to the consumption of alcohol, tobacco and betel quid. *Int J Cancer*. 2008;122:1347-1356.

- Interaction between alcohol and genetic factors

Prevalence of ALDH2 allele *2 (low activity):

Higher in Asian populations (e.g., 24% in Japan).

<1% in many other populations.

~30-50% in Asian Americans.

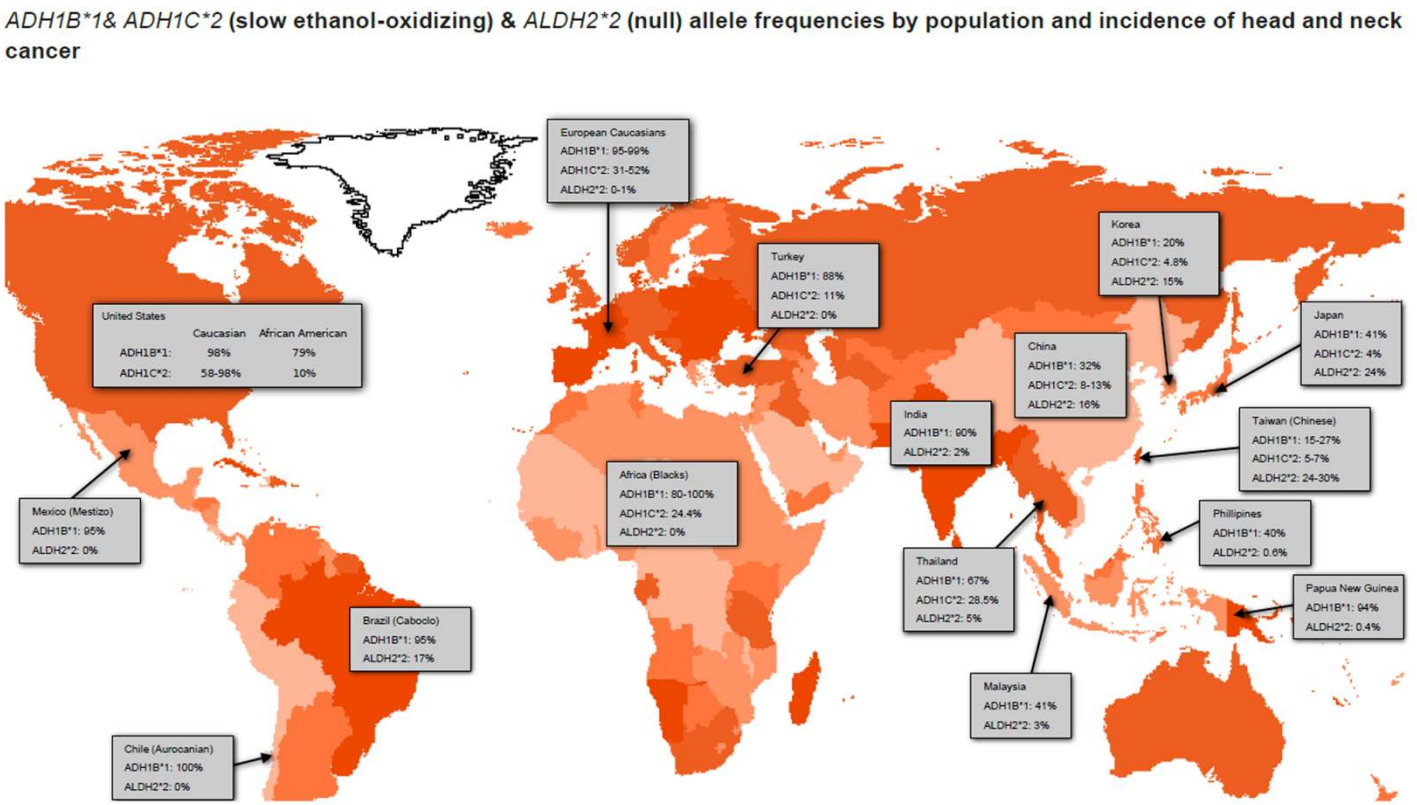





Figure from IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, vol 100. Part E: Personal habits and indoor combustions. 2012.
Data on Asian Americans from Eng et al. ALDH2, ADH1B, and ADH1C genotypes in Asians: A literature review. *Alcohol Res Health*. 2007;30(1):22-27.

- Other possible mechanisms:
  - DNA damage by reactive oxygen species (induction of ethanol-inducible CYP2E1)
  - Changes in the composition of the gut microbiota
  - Epithelial-barrier dysfunction and increased intestinal permeability (inflammation)
  - Decrease in folate absorption
  - Increases in circulating concentrations of estradiol, testosterone, and other sex hormones
  - Decreases in sex hormone-binding globulin concentrations

# Cancer burden attributable to alcohol consumption

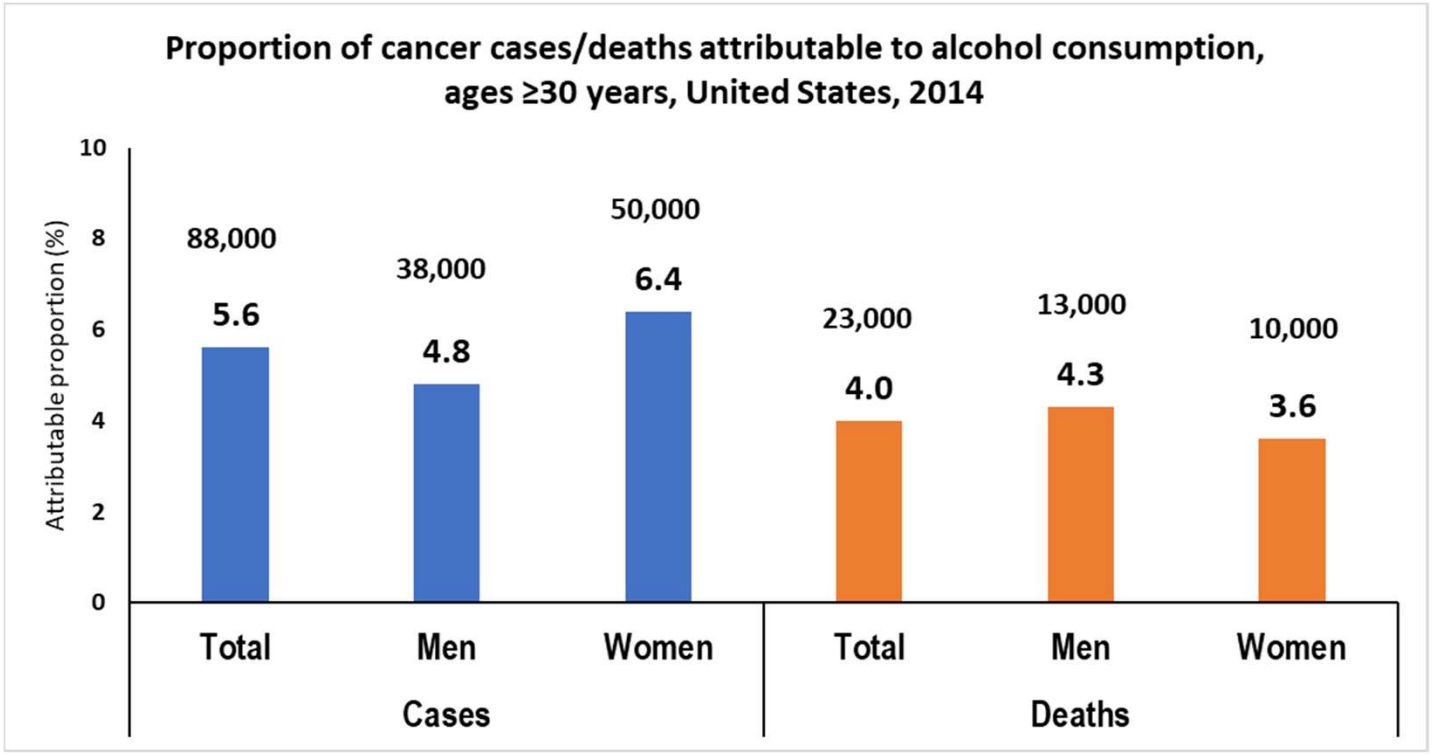
CA CANCER J CLIN 2018;68:31–54

# Proportion and Number of Cancer Cases and Deaths Attributable to Potentially Modifiable Risk Factors in the United States

Farhad Islami, MD, PhD [1]; Ann Goding Sauer, MSPH [2]; Kimberly D. Miller, MPH [2]; Rebecca L. Siegel, MPH [3]; Stacey A. Fedewa, PhD, MPH [4]; Eric J. Jacobs, PhD [5]; Marjorie L. McCullough, ScD, RD [6]; Alpa V. Patel, PhD [7]; Jiemin Ma, PhD, MHS [8]; Isabelle Soerjomataram, MD, PhD, MSc [9]; W. Dana Flanders, MD, DSc, MPH, MA [10]; Otis W. Brawley, MD, MACP [11]; Susan M. Gapstur, PhD, MPH [12]; Ahmedin Jemal, DVM, PhD [13]



Islami et al. Proportion and number of cancer cases and deaths attributable to potentially modifiable risk factors in the United States. *CA Cancer J Clin*. 2018;68(1):31-54.





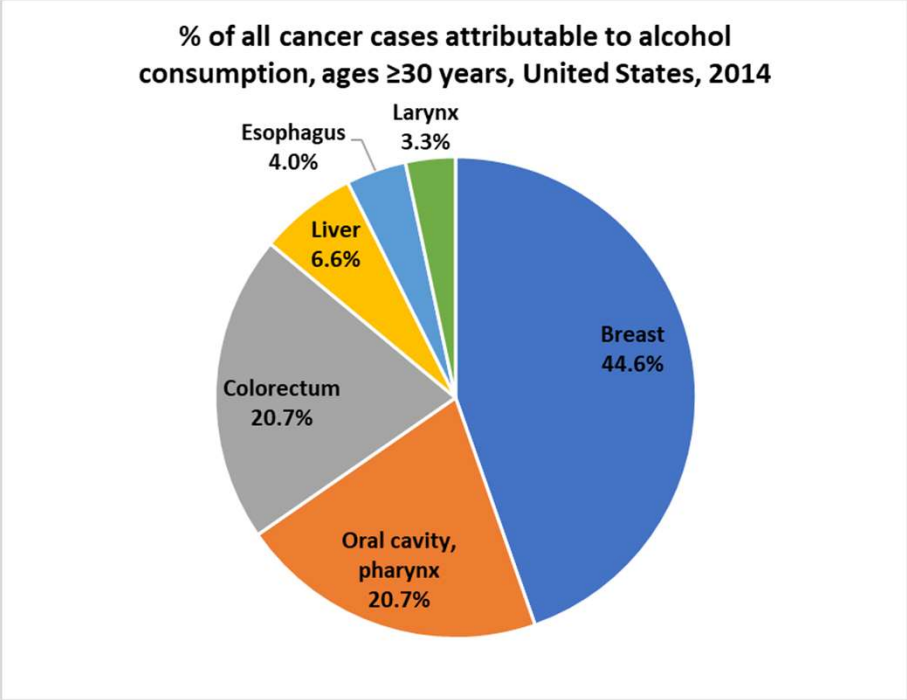

Islami et al. Proportion and number of cancer cases and deaths attributable to potentially modifiable risk factors in the United States. *CA Cancer J Clin*. 2018;68(1):31-54.

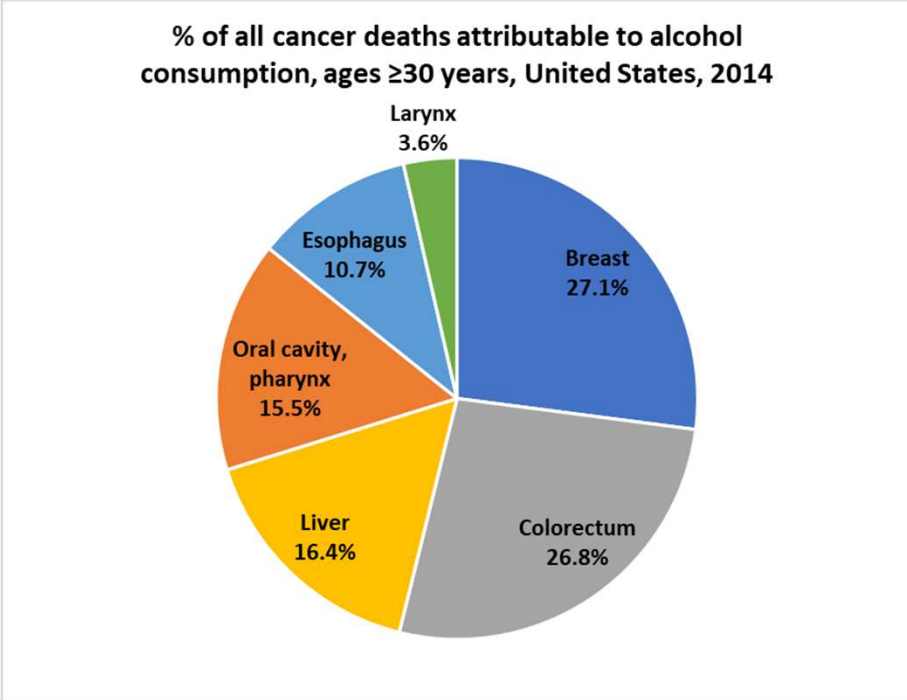
Estimated cancer cases and deaths in adults aged ≥30 years in the U.S. in 2014 attributable to alcohol consumption

| Cancer | Attributable cases, *N* | Attributable cases, % | Attributable deaths, *N* | Attributable deaths, % |
|---|---|---|---|---|
| Oral cavity, pharynx | 18,130 | 40.9% | 3,640 | 38.9% |
| Larynx | 2,930 | 23.2% | 840 | 22.3% |
| Liver | 5,750 | 21.6% | 3,840 | 20.4% |
| Esophagus | 3,540 | 21.0% | 2,510 | 16.8% |
| Breast | 39,060 | 16.4% | 6,350 | 15.4% |
| Colorectum | 18,090 | 12.8% | 6,290 | 12.0% |



Islami et al. Proportion and number of cancer cases and deaths attributable to potentially modifiable risk factors in the United States. *CA Cancer J Clin*. 2018;68(1):31-54.

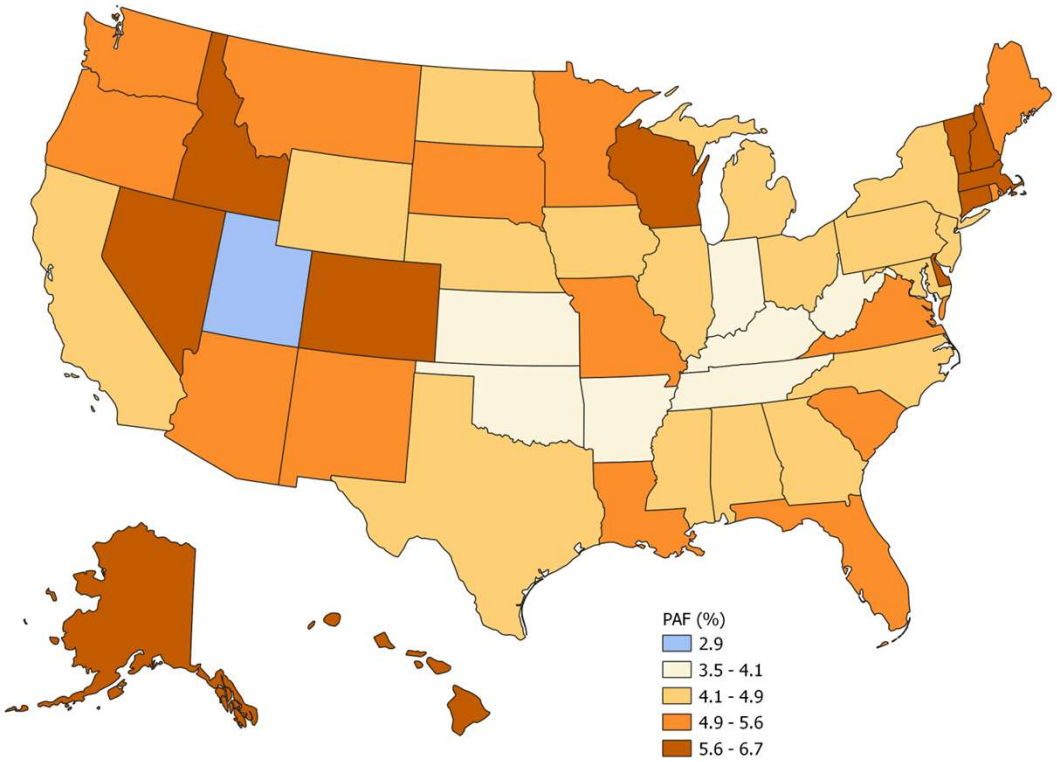





Islami et al. Proportion and number of cancer cases and deaths attributable to potentially modifiable risk factors in the United States. *CA Cancer J Clin*. 2018;68(1):31-54.

## Proportion of cancer cases attributable to alcohol consumption, ages ≥30 years, 2013-2016






Goding Sauer et al. Proportion of cancer cases and deaths attributable to alcohol consumption by US state, 2013-2016. *Cancer Epidemiol*. 2021;71:101893.

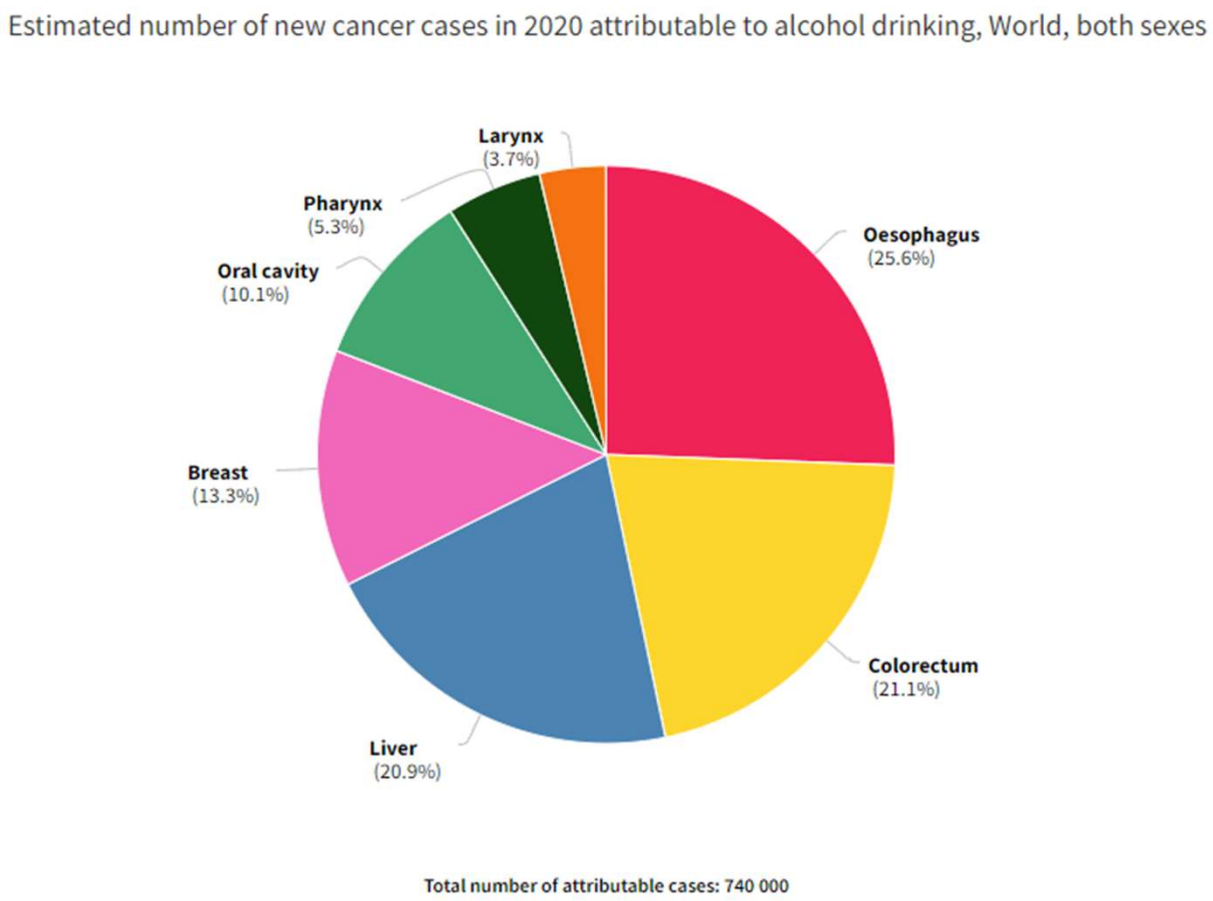
# Global burden of cancer in 2020 attributable to alcohol consumption: a population-based study

*Harriet Rumgay, Kevin Shield, Hadrien Charvat, Pietro Ferrari, Bundit Sornpaisarn, Isidore Obot, Farhad Islami, Valery E P P Lemmens, Jürgen Rehm, Isabelle Soerjomataram*

*Lancet Oncol* 2021; 22: 1071–80

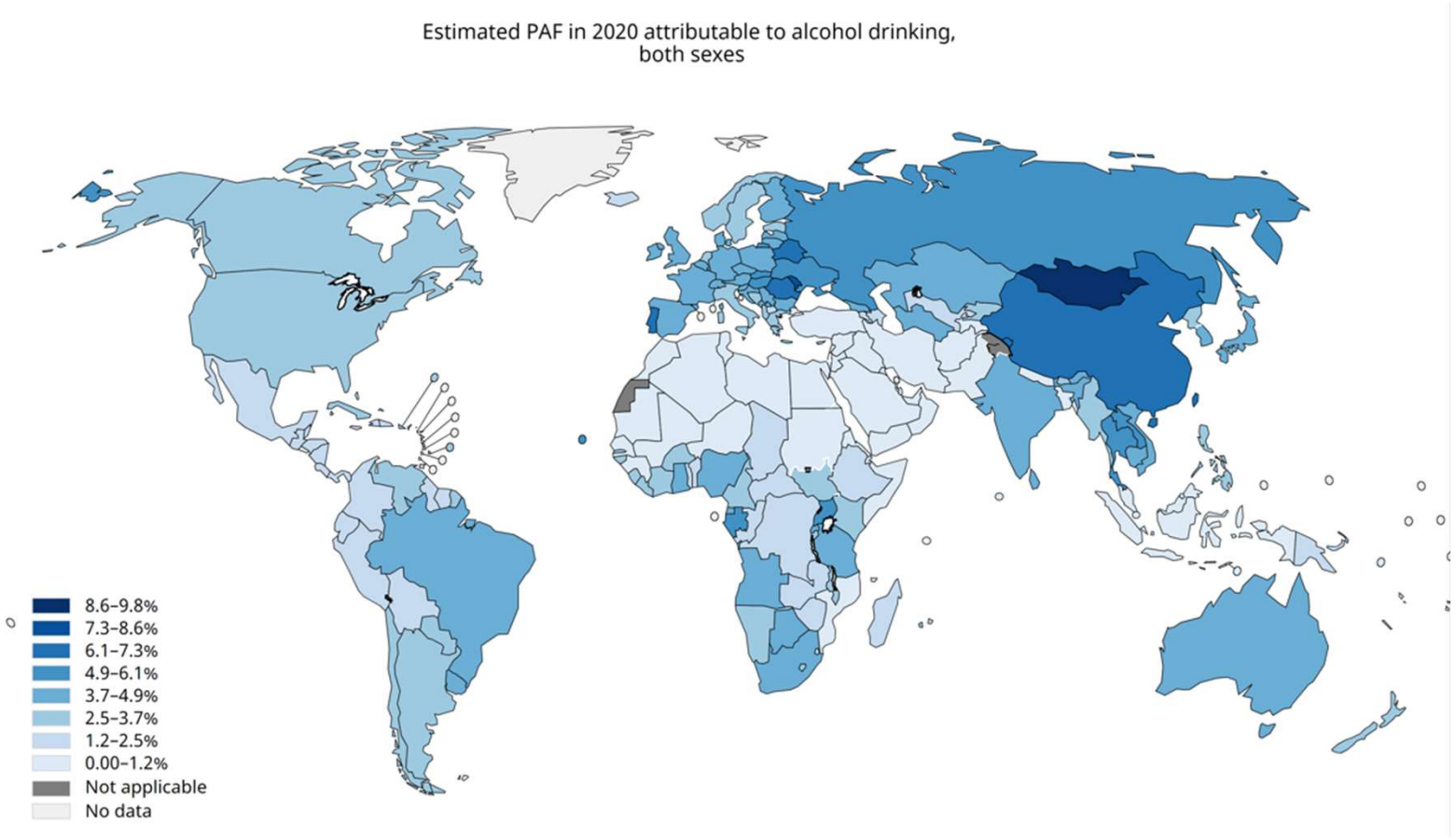


Rumgay et al. Global burden of cancer in 2020 attributable to alcohol consumption: a population-based study. *Lancet Oncol*. 2021;22:1017-1080.






Rumgay et al. Global burden of cancer in 2020 attributable to alcohol consumption: a population-based study. *Lancet Oncol*. 2021;22:1017-1080. Figure from IARC Global Cancer Observatory: https://gco.iarc.fr/



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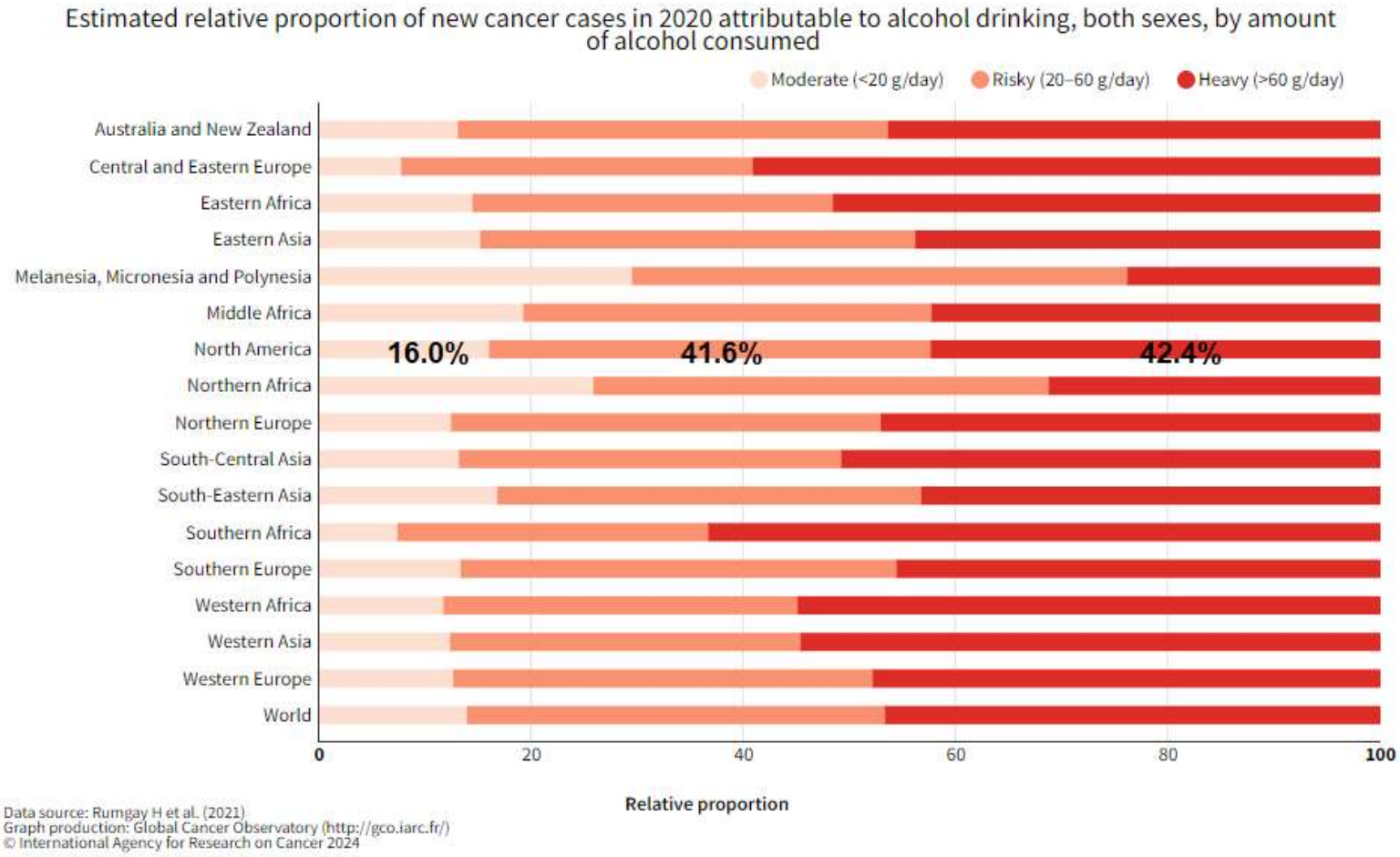




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# Alcohol reduction or cessation and cancer risk

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL REPORT

# The IARC Perspective on Alcohol Reduction or Cessation and Cancer Risk

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Gapstur et al. The IARC perspective on alcohol reduction or cessation and cancer risk. *N Engl J Med*. 2023;389:2486-2494.

| Cancer Site | Type and Number of Studies |
|---|---|
| **Oral cavity** | Cohort: *n* = 2<br>Case–control: *n* = 5 (all hospital-based)<br>Pooled analysis: *n* = 1 (4 population-based and 8 hospital-based case–control studies) |
| **Esophagus** | Cohort: *n* = 4<br>Case–control: *n* = 11 (3 population-based and 8 hospital-based)<br>Pooled analysis: *n* = 1 (2 cohort studies)<br>Meta-analysis: *n* = 1 (4 hospital-based case–control studies) |
| **Larynx** | Cohort: *n* = 3<br>Case–control: *n* = 3 (all hospital-based)<br>Pooled analysis: *n* = 1 (2 population-based and 7 hospital-based case–control studies) |
| **Colorectum** | Cohort: *n* = 10<br>Case–control: *n* = 6 (3 population-based and 3 hospital-based)<br>Pooled analysis: *n* = 1 (3 cohort studies) |
| **Breast** | Cohort: *n* = 11<br>Case–control: *n* = 10 (4 population-based, 4 hospital-based, 2 both) |
| **Pharynx** | Cohort: *n* = 2<br>Case–control: *n* = 6 (4 hospital-based, 1 population-based, and 1 friend- or family-based)<br>Pooled analysis: *n* = 1 (4 population-based and 9 hospital-based case–control studies) |
| **Liver** | Cohort: *n = 9* (1 among participants with alcohol-related liver disease)<br>Case–control: *n* = 3 (all hospital-based) |



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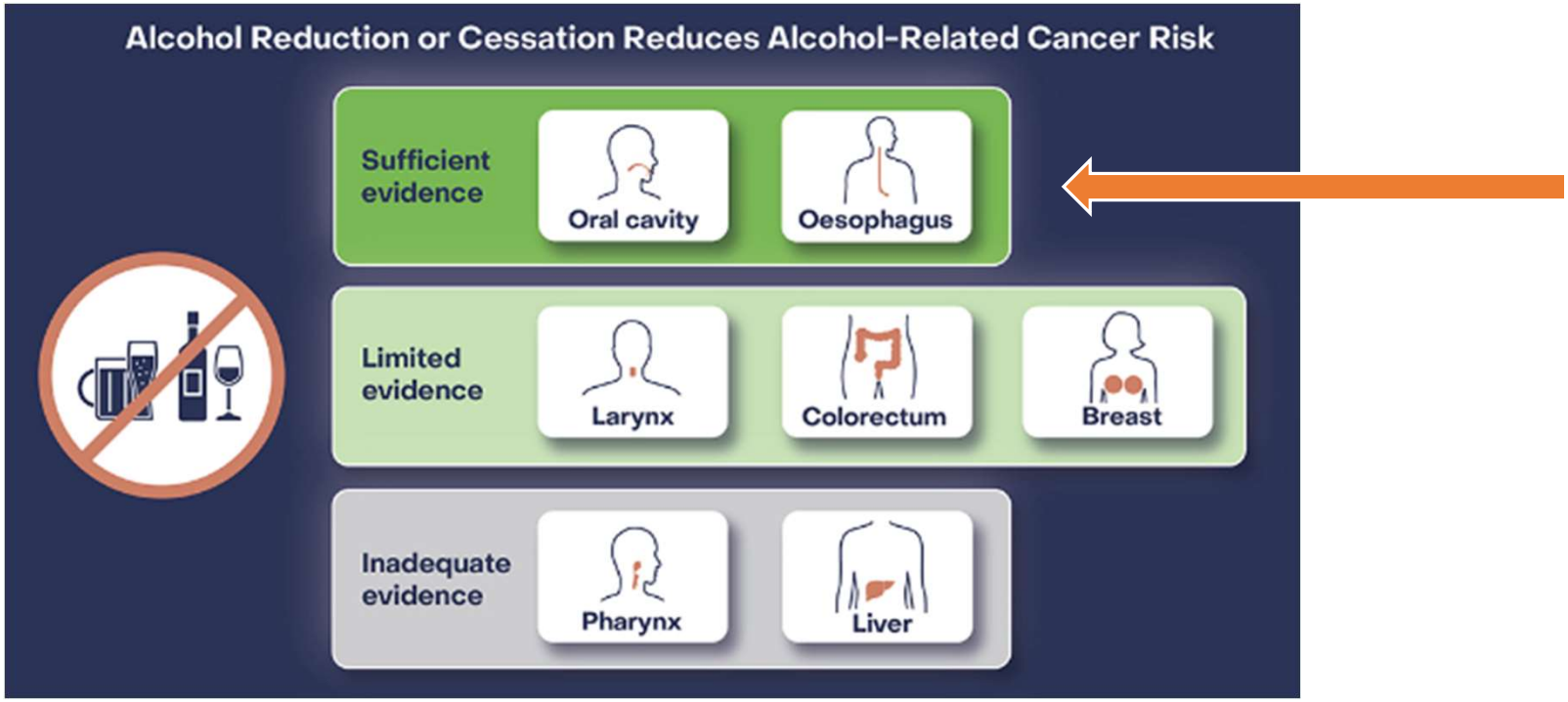
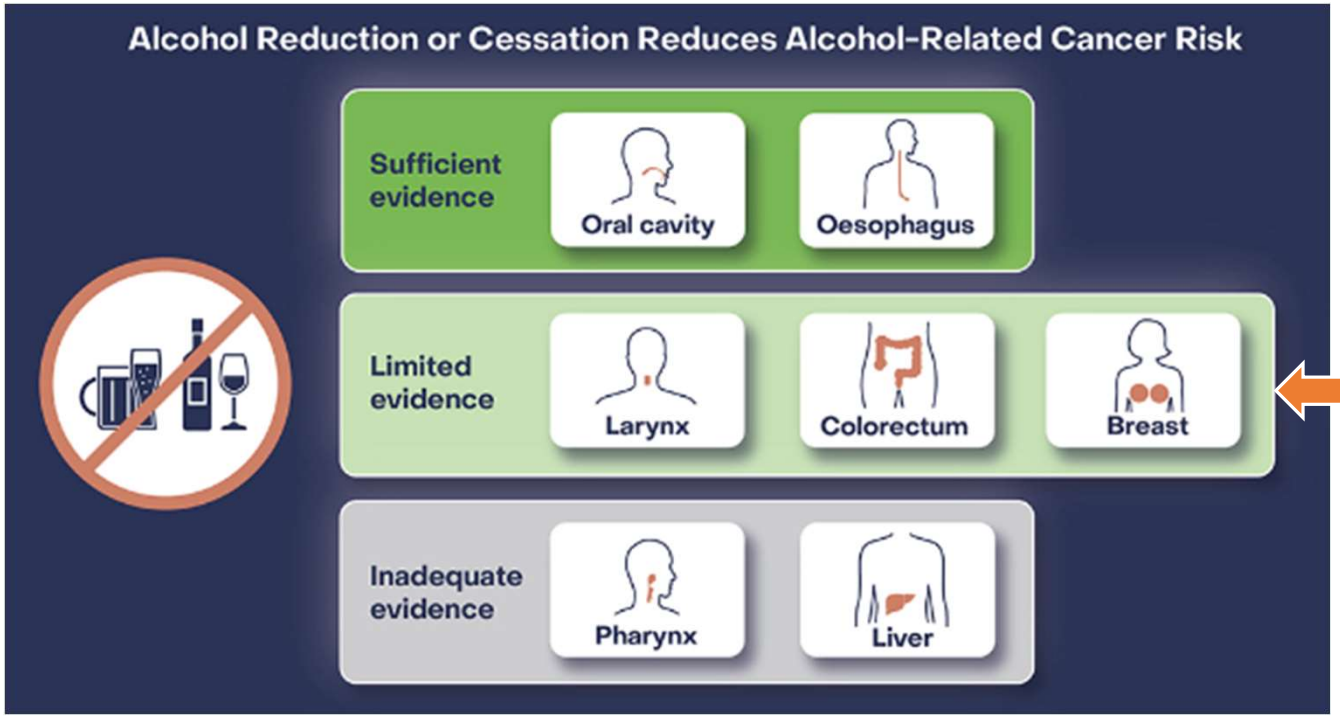



Sufficient evidence: A causal preventive association between the intervention and cancer in humans has been established. That is, a cancer-preventive association has been observed consistently in the body of evidence (including several high-quality studies) and chance, bias, and confounding as causes of this association were ruled out with reasonable confidence.



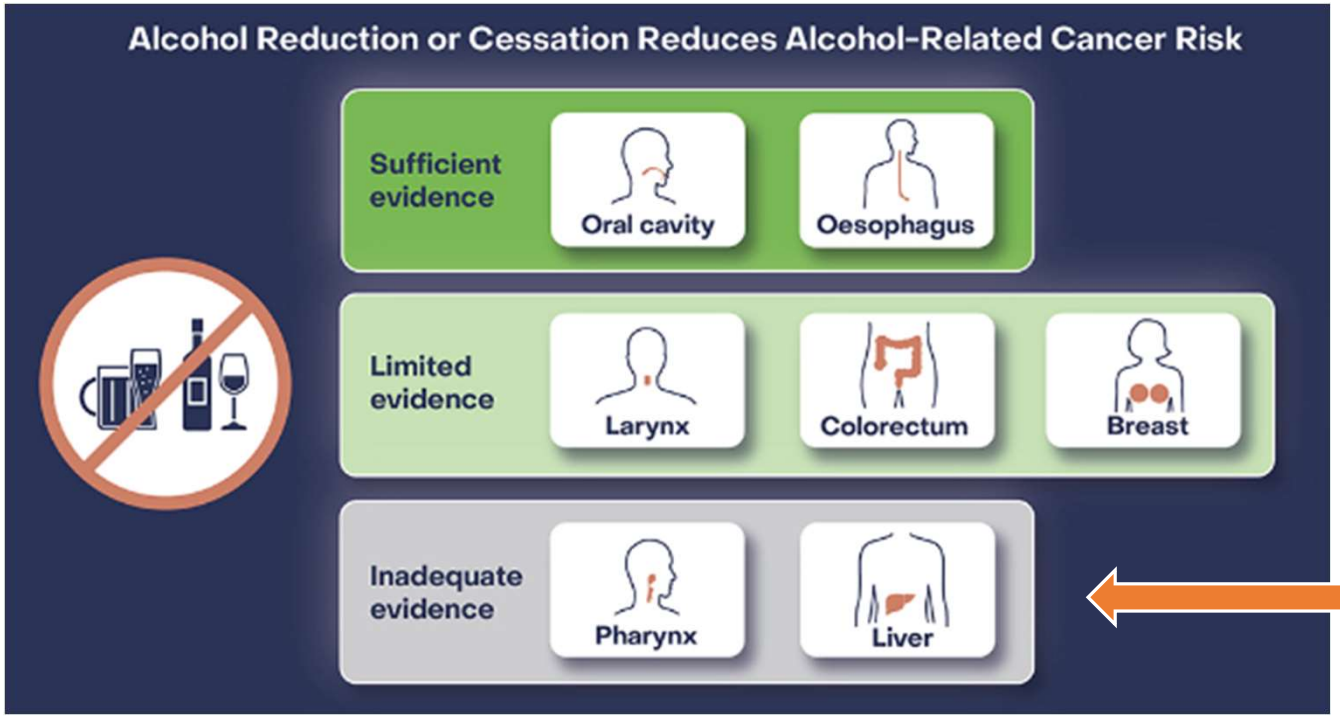
Figure from IARC Handbooks of Cancer Prevention Volume 20A: Reduction or cessation of alcohol consumption. 2023. iarc.who.int/wp-content/uploads/2023/12/HB20A-zoom.jpg




Limited evidence: A causal preventive association between the intervention and cancer in humans is plausible. That is, a cancer-preventive association has been observed in the body of evidence, but chance, bias, or confounding as causes of this association could not be ruled out with reasonable confidence.



Figure from IARC Handbooks of Cancer Prevention Volume 20A: Reduction or cessation of alcohol consumption. 2023. iarc.who.int/wp-content/uploads/2023/12/HB20A-zoom.jpg




Inadequate evidence: The current body of evidence does not enable a conclusion to be drawn about the presence or absence of a preventive association between the intervention and cancer in humans. Common situations include: (a) no data are available in humans; (b) there are studies available in humans, but of poor quality or informativeness; and (c) there are studies available in humans of sufficient quality, but their results are inconsistent or otherwise do not enable a conclusion to be drawn.



Figure from IARC Handbooks of Cancer Prevention Volume 20A: Reduction or cessation of alcohol consumption. 2023. iarc.who.int/wp-content/uploads/2023/12/HB20A-zoom.jpg


Mechanisms with strong evidence

Strong mechanistic evidence: There are a substantial number of high-quality studies in humans that consistently link the intervention to a mechanistic pathway by which it could prevent cancer.



Figure from IARC Handbooks of Cancer Prevention Volume 20A: Reduction or cessation of alcohol consumption. 2023. iarc.who.int/wp-content/uploads/2023/12/HB20A-zoom.jpg

# Evidence gaps

- Patterns of consumption over the life course, including earlier in life, and cancer risk

**Alcohol Intake in Early Adulthood and Risk of Colorectal Cancer: Three Large Prospective Cohort Studies of Men and Women in the United States**

Hur et al. *Eur J Epidemiol.* 2021 March ; 36(3): 325–333

- Effects of heavy episodic (binge) drinking
- Alcohol consumption and risk of additional cancer types/subtypes
    - e.g., cancer of the pancreas



Gapstur et al. Alcohol and cancer: Existing knowledge and evidence gaps across the cancer continuum. *CEBP*. 2023;389:2486-2494.

- Confounding and modifying effects of other factors
  - e.g., HPV and oropharyngeal cancer
  - variants of alcohol-metabolizing enzymes (e.g., ALDH2) and cancer types other than upper aerodigestive tract cancers
- Biologic mechanisms
- Effects of alcohol reduction and cessation
  - duration of cessation
  - mechanisms
- Influence of alcohol on cancer disparities
- Alcohol's effects on tumor progression
- Alcohol's effects on cancer treatment efficacy



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# Conclusions

- Alcohol consumption →
  - increased risk of at least 7 cancer types
  - About 90,000 new cancer cases and 23,000 cancer deaths per year in the United States
  - higher burden/risk in certain populations (e.g., among individuals who smoke)
- Prevention is important
- Alcohol cessation and reduction can reduce the risk of cancer among individuals who drink

- Even low consumption levels are associated with several cancer types
- No difference between various types of alcoholic beverages and cancer risk
- Low awareness about alcohol and cancer risk

- Dietary Guidelines for Americans
  - do not recommend that individuals who do not drink alcohol start drinking for any reason
  - adults of legal drinking age can choose not to drink, or to drink in moderation by limiting intake to ≤2 drinks/day for men or ≤1 drink/day for women
- American Cancer Society
  - it is best not to drink alcohol
  - people who choose to drink alcohol should limit their intake to ≤2 drinks/day for men and ≤1 drink/day for women
- World Health Organization
  - no level of alcohol consumption is safe for our health

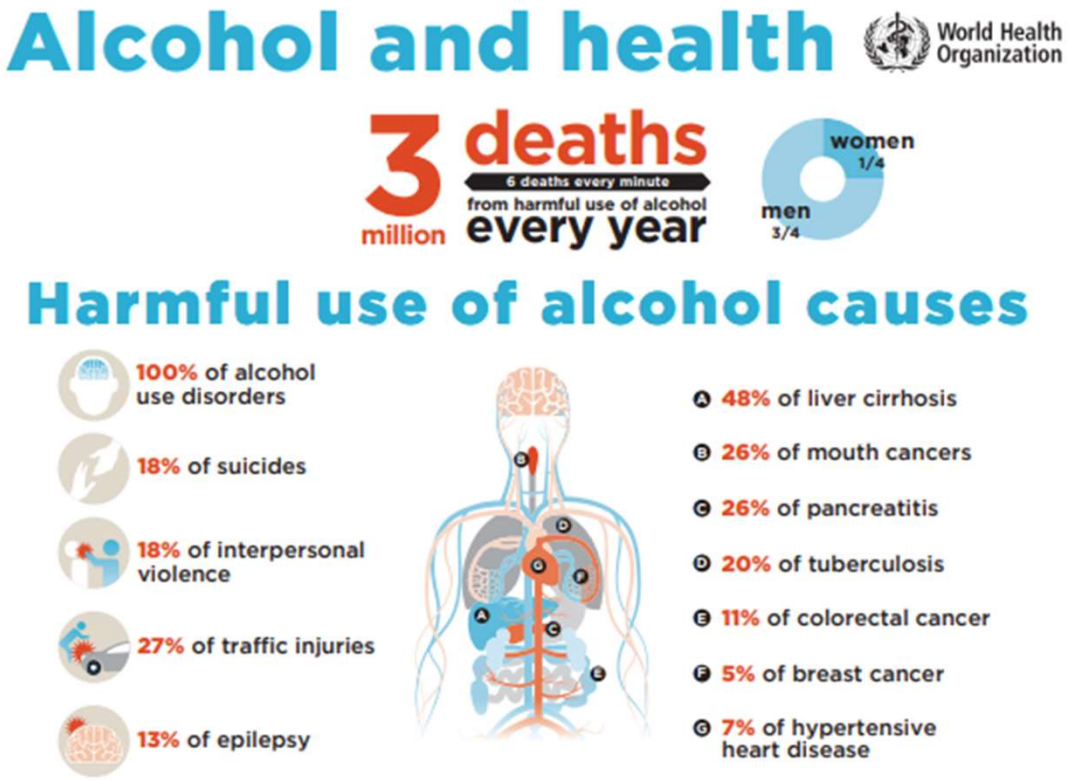




Figure from the World Health Organization. https://www.who.int/images/default-source/departments/substances-abuse/alcohol/infographics/alcohol-3-million-death-every-year.png?sfvrsn=8062967_2

# *Thank You!*