Diet low in whole grains—Level 3 risk

Summary In 2019, a diet low in whole grains was responsible for 42·6 million (95% UI 22·3–53·2) DALYs and 1·84 million (0·921–2·34) deaths. It was the second-leading dietary risk factor for attributable DALYs.

Definition Diet low in whole grains is defined as average daily consumption (in grams per day) of less than 140–160 grams of whole grains (bran, germ, and endosperm in their natural proportion) from breakfast cereals, bread, rice, pasta, biscuits, muffins, tortillas, pancakes, and other sources.

	Total sources
Exposure	52
Relative risk	37

Table 1: Total sources used in GBD 2019 estimation

What is new in GBD 2019?

- The method of bias adjustment for non-dietary recall surveys was updated using MR-BRT.
- After evaluating the most recent epidemiological evidence, we found insufficient evidence supporting the causal relationship of whole grains intake with haemorrhagic stroke and removed it as an outcome. We also found sufficient evidence supporting the causal relationship of whole grains intake with colorectal cancer and added it as an outcome.
- We updated the dose–response curve of relative risk for whole grains and its outcomes based on the most recent epidemiological evidence and a newly developed method for characterising the risk curve.
- The whole grains TMREL changed from 100–150 to 140–160 grams/day.

|	Deaths		YLLs		YLDs		DALYs	
	Number (millions)	Rate (per 100 000)	Number (millions)	Rate (per 100 000)	Number (millions)	Rate (per 100 000)	Number (millions)	Rate (per 100 000)
2019								
Both sexes	1·84 (0·921 to 2·34)	23·5 (11·8 to 29·8)	39·0 (19·1 to 49·1)	476·1 (233·8 to 600·0)	3·62 (2·04 to 5·41)	43·9 (24·9 to 65·4)	42·6 (22·3 to 53·2)	520·0 (273·0 to 650·1)
Females	0·810 (0·419 to 1·03)	18·5 (9·6 to 23·4)	14·7 (7·57 to 18·6)	337·2 (174·0 to 426·9)	1·77 (1·01 to 2·64)	40·9 (23·3 to 60·9)	16·4 (8·84 to 20·6)	378·1 (203·6 to 473·7)
Males	1·03 (0·506 to 1·31)	29·3 (14·3 to 37·2)	24·3 (11·7 to 30·8)	624·8 (300·8 to 790·2)	1·85 (1·03 to 2·79)	47·2 (26·6 to 70·8)	26·2 (13·3 to 32·9)	671·9 (340·5 to 847·0)
Percentage change 2010–19								
Both sexes	17·5% (11·9 to 23·0)	–10·3% (–14·4 to –6·2)	13·0% (6·9 to 19·5)	–10·4% (–15·2 to –5·4)	33·2% (29·6 to 36·6)	5·5% (2·6 to 8·1)	14·5% (8·7 to 20·5)	–9·3% (–13·8 to –4·6)
Females	18·1% (11·1 to 25·3)	–10·6% (–15·8 to –5·2)	14·6% (6·3 to 22·7)	–10·1% (–16·5 to –3·7)	32·4% (29·0 to 35·6)	5·1% (2·5 to 7·6)	16·3% (8·8 to 23·6)	–8·6% (–14·6 to –2·9)
Males	17·0% (9·8 to 24·2)	–10·1% (–15·3 to –5·1)	12·1% (4·2 to 19·6)	–10·6% (–16·6 to –4·8)	34·0% (30·1 to 37·6)	5·8% (2·4 to 8·7)	13·4% (5·9 to 20·8)	–9·6% (–15·4 to –4·0)

Numbers in parentheses are 95% uncertainty intervals.

Table 2: Attributable global deaths, YLLs, YLDs, and DALYs in counts and age-standardised rates for both sexes combined, females, and males, 2019, with percentage change between 2010 and 2019

	Deaths	YLLs	YLDs	DALYs
1990	16th	18th	30th	19th
2010	13th	16th	26th	16th
2019	10th	14th	26th	14th

Table 3: Rank among attributable Level 3 risks plus most detailed Level 2 risks of global deaths, YLLs, YLDs, and DALYs in 1990, 2010, and 2019 for both sexes combined
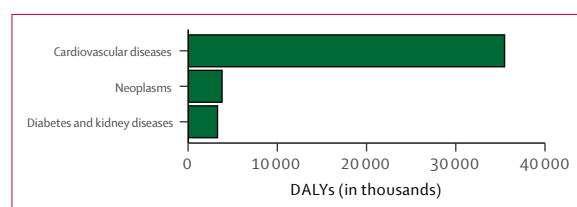
Figure 1: Composition of attributable global DALYs by constituent Level 2 causes for both sexes combined, 2019
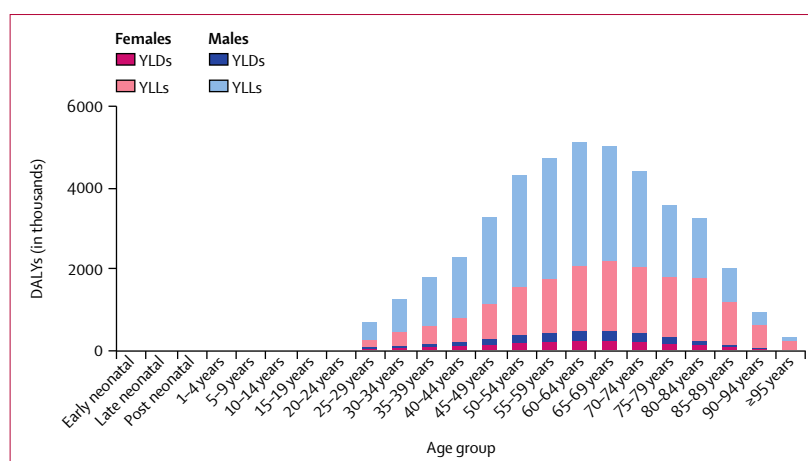
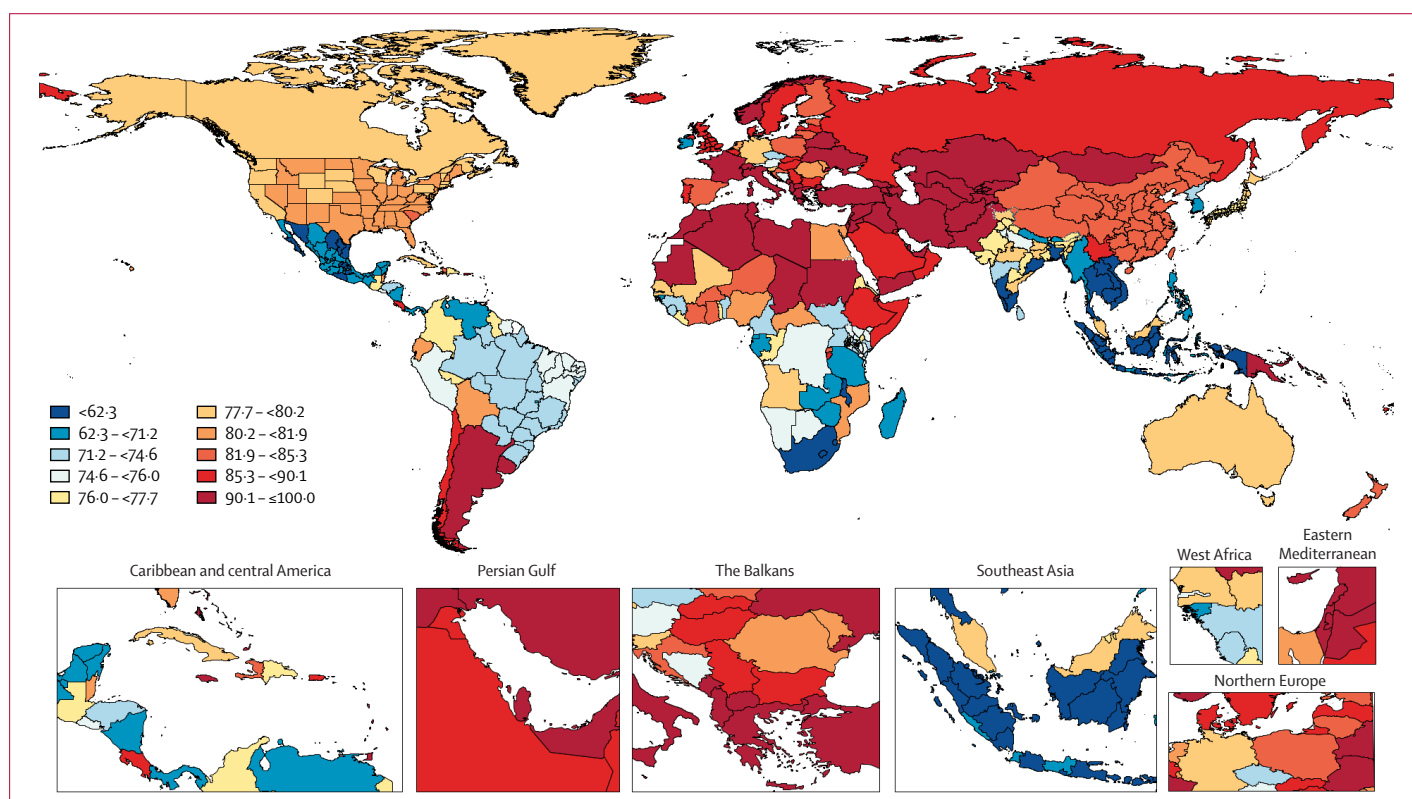*Figure 2:* Composition of attributable global DALYs by YLLs and YLDs, age group, and sex, 2019

Figure 3: Age-standardised all-cause SEV by location, both sexes combined, 2019
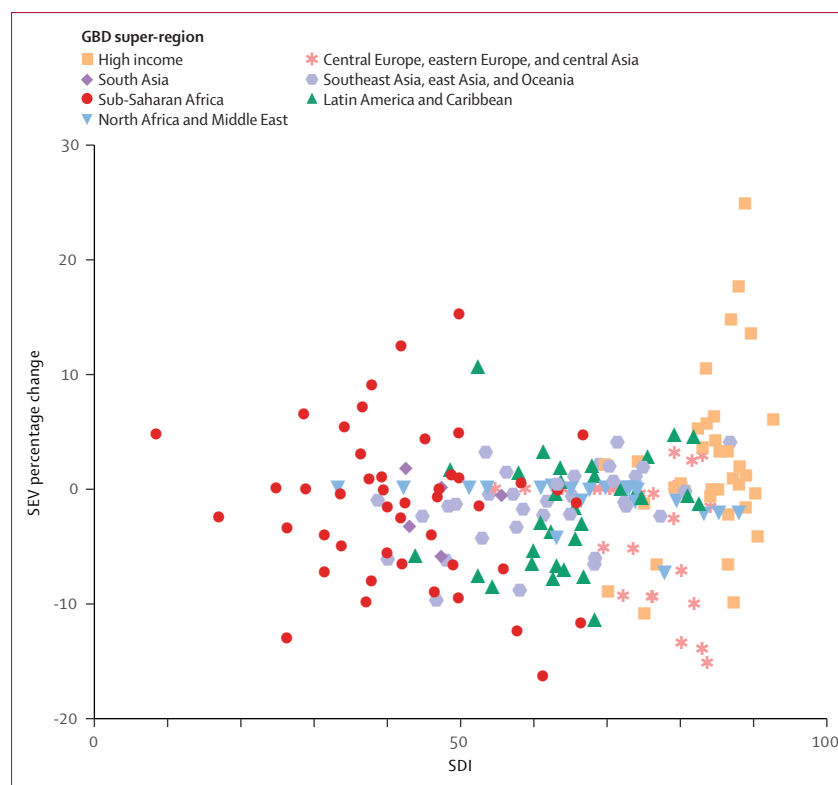

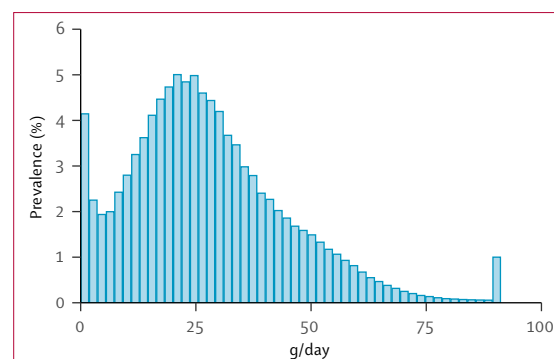**Figure 4:** Percentage change in all-cause age-standardised SEV by SDI, both sexes combined, 1990–2019

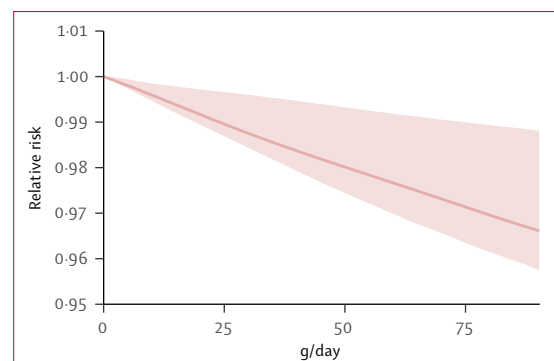**Figure 5:** Percentage of population exposed to risk factor, both sexes combined, 2019

Figure 6: All-cause mortality relative risk, both sexes combined, 2019