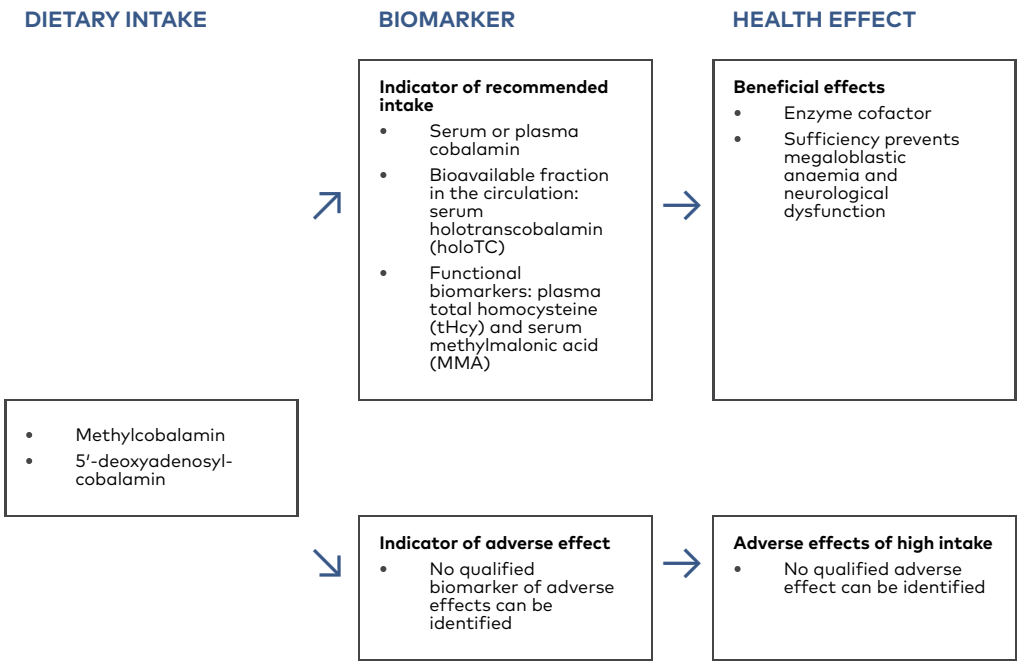
Vitamin B_{12}



	Females	Males
Provisional AR (µg/d)	3.2	3.2
AI (µg/d)	4.0	4.0

For more information about the health effects, please refer to the background paper by Anne-Lise Bjørke Monsen and Vegard Lysne (Bjørke-Monsen & Lysne, 2023).

Dietary sources and intake. Vitamin B_{12} is a water-soluble vitamin that is naturally present in animal-based foods. Main sources in Nordic and Baltic diets are meat, liver, dairy products, fish, and shellfish. The average vitamin B12 intake ranges from 2.9 to 8.9 µg/d (Lemming & Pitsi, 2022).

Main functions. Vitamin B_{12} (cobalamin) is a cofactor for two enzymes in the human metabolism (2-5). Methylcobalamin is a cofactor for methionine synthase, the enzyme that catalyses the conversion of homocysteine to methionine. Adenosylcobalamin is a cofactor for methylmalonyl-CoA mutase in the isomerization of methylmalonyl-CoA to succinyl-CoA. An adequate

supply of vitamin B_{12} is essential for normal development, neurological function, and blood formation.

Indicator for recommended intake. Biomarkers of vitamin B_{12} status include serum and plasma B_{12} and holoTC (bioavailable fraction in the circulation), and the functional biomarkers total homocysteine (tHcy) and methylmalonic acid (MMA). All four B_{12} biomarkers have limitations as standalone markers, and a combination of biomarkers is the most suitable approach to derive DRVs for vitamin B_{12} (Allen et al., 2018; Bjørke-Monsen & Lysne, 2023; EFSA, 2015c; IOM, 1998b). Because vitamin B_{12} is essential for folate metabolism, it is also important to consider folate status.

Main data gaps. Data are needed to improve the definition of deficiency. In addition, there are insufficient data to derive an AR for infants and children. A *de novo* NNR2023 systematic review concluded that there is not enough evidence to conclude if the habitual vitamin B_{12} intake, or an intake in line with the previous NNR (NNR2012), is sufficient to maintain adequate status for populations susceptible to vitamin B12 deficiency (i.e., children pregnant and lactating women, young adults, older adults, and vegetarians or vegans) (Bärebring et al., 2023).

Deficiency and risk groups. The main clinical symptoms of vitamin B_{12} deficiency is macrocytic, megaloblastic anaemia or neurologic dysfunction. Deficiency also causes increased plasma tHcy.

People with prolonged restriction of animal products in their diets, such as vegetarians and vegans, are at risk of becoming vitamin B_{12} deficient unless consuming supplements or fortified foods. Frequent causes of a decline in cobalamin status in older adults are malabsorption of cobalamin bound to food as a consequence of atrophic gastritis. The neonatal period is particularly sensitive to cobalamin insufficiency and deficiency.

Dietary reference values. In NNR2023, an AI is set to 4.0 µg/day (females and males), derived from the AI set by EFSA (2015c), which is based on both different biomarkers of cobalamin status and observed intakes. Provisional AR is set to 3.2 µg/day (females and males). Not sufficient data to derive UL.