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# Food group intake trends in the Spanish population (2003–2023) in women and men and by age groups, country of origin, and social class: a time-series analysis of nationally representative surveys

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## Abstract

**Background** We analyzed the intake evolution of 14 food groups (vegetables, fruits, legumes, bread/flours and breakfast cereals, pasta/rice and potatoes, fish, unprocessed meat, processed meat, dairy products, eggs, sweets, snacks, soft drinks, and fresh juices) in Spanish population between 2003 and 2023, for women and men separately and by age groups, country of origin, and social class.

**Methods** Using data from the Spanish National and European Health Surveys (2003–2023), combined with the ENALIA/ENALIA-2 surveys, we converted the consumption frequencies of each group into estimated daily intakes in g/day. We modeled their trends over time using locally estimated scatterplot smoothing regressions.

**Results** We observed: an increase over time in the consumption of vegetables ( $\Delta$ 2003–2023: +25%), legumes (+10%), eggs (+50%), and snacks (+44%); and a decrease over time in the intake of soft drinks (-40%) and fresh juices (-24%), sweets (-16%), bread/flours and breakfast cereals (-13%), pasta/rice and potatoes (-11%), fish (-18%), dairy products (-10%), and processed meat (-9%). No large differences were observed between women and men and by social class. A more beneficial evolution was observed in ages 25–34 (with poorer dietary habits in 2003) and in individuals not born in Spain, and a more detrimental evolution was reported in ages  $\geq 55$  and 5–14.

**Conclusions** The dietary habits of the Spanish population between 2003 and 2023 have improved in some aspects (more vegetables and legumes; fewer soft drinks, juices, sweets, and processed meat) and worsened in others (less

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fish and dairy products, more snacks), with notable differences by age groups and country of origin but not between women and men and by social class.

**Keywords** Food and beverages, Diet surveys, Age groups, Gender role, Country of origin, Social class

## Background

Western dietary patterns are characterized by high intakes of ultra-processed foods, sugars, and fats, and a low consumption of plant-based products [1, 2]. However, the temporal evolution of dietary habits has not been comprehensively described, because most studies are cross-sectional [3] or focused on a limited number of food groups or population Sect [4]. Only one narrative review has reported that, since the 1990s, most European populations have reduced their intakes of sugars, refined carbohydrates and saturated fats while eating more fruits and vegetables. Conversely, Mediterranean countries have increasingly “westernized” their diets (with lower fruit, vegetable, and fish intakes), and fish intake has also declined in traditional high-consumption regions (e.g., Finland) and increased in Eastern countries [5]. Regarding Spain, various cross-sectional studies (the “Nutrition Transition in Spain” paper with 1987–1997 data, the Food Consumption Survey updates in the 2000s, and the ANIBES nationwide intake survey in 2013–14, and the *Encuesta Nacional de Alimentación en la población Infantil y Adolescente* [ENALIA] and *Encuesta Nacional de Alimentación en población adulta, mayores y embarazadas* [ENALIA-2] surveys) suggest an qualitative improvement in the dietary patterns of Spanish population, with sustained declines in added sugars, refined cereals and saturated fat, alongside consistently high fruit, vegetable and fish intake [5–11]. With respect to time-series data on the consumption of food groups in Spain, only the Spanish Health Surveys (SHS) have provided snapshots of dietary behavior, reporting only modest changes in the proportion of the population consuming fruits and vegetables daily [12]. Nevertheless, no study has comprehensively examined temporal trends of food group intake in the Spanish population as a whole or by groups (women and men, age groups, and socioeconomic determinants). As dietary exposures are major, modifiable drivers of chronic disease, tracking population-level trends in food group intake is a core component of public health nutrition surveillance, a prerequisite for prioritizing interventions and evaluating policy actions [13, 14]. In this context, long-run trends can help identify population groups with unfavorable trajectories, inform and monitor adherence to food-based dietary guidelines, and provide baseline evidence to interpret the potential impact of societal and policy changes. Moreover, producing harmonized estimates from repeated nationally representative surveys offers a framework that can be replicated elsewhere to support

cross-country comparisons and public health accountability. Therefore, we aim to analyze trends in the average intake of 14 key food groups (vegetables; fresh fruit; bread and cereals; pasta, rice, and potatoes; legumes; fish, unprocessed meat; processed meat; dairy products; eggs; sweets; snacks; soft drinks; and fruit/vegetable fresh juices) between 2003 and 2023 in the Spanish population, in women and men, and by age groups, country of origin and social class using data from the SHS and the European Health Survey in Spain (EHSS).

## Materials & methods

### Estimation of food group intakes

To estimate the mean grams consumed per day for every food group and age category (in 2003, 2006, 2011, 2014, 2017, 2020, and 2023), we multiplied the eating frequency of each food group recorded in successive waves of the SHS and the EHSS by the corresponding average intake of the food groups measured in ENALIA/ENALIA-2.

### Eating frequency of food groups: Spanish health surveys and European health surveys in Spain

The SHS series, conducted by the Spanish Ministry of Health and the Spanish National Statistics Institute, has provided nationwide data on health data, including dietary behaviors, since 2003 in Spanish population of all ages [15]. We used data from the SHS of 2003, 2006, 2011, 2017, and 2023. The EHSS is the Spanish part of the European Health Interview Survey, conducted by Eurostat and the Spanish National Statistics Institute, which gathers harmonized health data (including diet) from individuals aged  $\geq 15$  across European Union member states [16]. We used data from the EHSS of 2014 and 2020. Data from the 2009 EHSS were not considered because it only focused on the consumption of fruits and vegetables and used different questions to inquire about food intake frequency. Both SHS and EHSS are designed to be representative of the Spanish population because they cover the entire national territory and use stratified multistage sampling of individuals living in community dwellings [17, 18].

The surveys asked respondents about their consumption of: vegetables; fruit; bread, flours, and breakfast cereals; pasta, rice, and potatoes; legumes; fish, unprocessed meat; processed meat; dairy products; eggs; sweets; salty snacks; soft drinks; and fresh fruit/vegetable juices. Supplementary Table 1 summarizes which food group consumption information was collected in each survey. Both surveys assessed total food group intake frequency by

asking respondents how often specific foods were consumed and categorized responses as “daily”, “3 + times per week”, “1–2 times per week”, “<1 per week”, or “never”. Both surveys provided data for the entire population, women and men separately (this information was self-reported and analyzed as binary), different age groups (SHS: ages 1–4, 5–14, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, and 75 or older; EHSS: ages 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, and 75 or older), individuals born and not born in Spain, and social class based on the occupation of the reference person of each household interviewed (I: senior managers [ $\geq 10$  staff] and graduate professionals; II: small-firm managers, diploma-level professionals, artists/athletes; III: intermediate non-manual employees and self-employed without staff; IV: production supervisors and skilled manual/technical workers; V: skilled primary-sector and other semi-skilled manual workers; VI: low-skilled manual workers) [19].

#### **Average intake of food groups: ENALIA and ENALIA-2**

ENALIA and ENALIA-2 reported the average intake of numerous food items in ages 1–3, 4–9, 10–17, 18–39, 40–64, and 65–74 in the Spanish population in 2016 [10, 11]. We used these data to calculate the average and standard error of intake for the 14 food groups assessed in the SHS and EHSS, grouping the food items investigated in ENALIA/ENALIA-2 as described in Supplemental Table 2. Since the age groups investigated in ENALIA/ENALIA-2 do not correspond to those investigated in the SHS and EHSS, we converted the average consumption of food groups reported in ENALIA/ENALIA-2 to the age groups described in SHS and EHSS and for the whole population using weighted means, as described in Supplementary Table 3. The resulting average intake of food groups for all age subpopulations in 2016 is available in Supplemental Table 4.

#### **Estimation of intake of food groups in 2003, 2006, 2011, 2014, 2017 and 2020**

We converted frequency categories into daily serving equivalents as follows: 1 serving/day for “daily” intake, 4.5/7 (0.64 servings/day) for “3–6 times per week”, 1.5/7 (0.21 servings/day) for “1–2 times per week”, 0.5/7 (0.07 servings/day) for “<1 per week”, and 0 servings/day for “never”. Consumption of the 14 food groups in grams/day was obtained by multiplying daily servings by the average intake of the food groups across all age groups. We applied a scaling factor so that the 2017 SHS estimate matched the 2016 ENALIA/ENALIA-2 reference, thereby anchoring the entire time series to the ENALIA results.

#### **Statistical analyses**

Annual means (grams/day) and 95% confidence intervals were available for each food group and subpopulation for survey years 2003, 2006, 2011, 2014, 2017, 2020 and 2023. We calculated the percentage change in intake for all food groups across all subpopulations between the first and the last year with available data. Additionally, for every subpopulation, we fitted locally estimated scatterplot smoothing models to the point estimates. The smoothed line represents the expected intake trajectory; pointwise confidence intervals were carried forward by independently smoothing the lower and upper bounds and plotting the resulting ribbon.

Analyses were conducted in R (version 4.3.1).

#### **Results**

The evolution of food group intake for the whole population, women and men, and age groups is described in Figs. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14 (exact estimated values are available in Supplemental Table 5), and percentage changes in food intake (2003–2023) in these populations are available in Table 1.

#### **Vegetables**

Vegetable intake increased from 115 to 143 g/day between 2003 and 2020 (all individuals: +25%; women: +22%; men: +27%; Figs. 1A–C) and was higher in older age groups. All age groups increased vegetable intake over time, especially ages 15–24 (+16%) and 25–34 (+26%; Figs. 1F–G). Among individuals aged 45 and older, intake plateaued around 135–155 g/day, the highest reported, with smaller gains over time (Figs. 1I–L).

#### **Fruits**

Fruit consumption remained stable between 2003 and 2023 (all individuals: no change; women: -2%; men: +2%; Figs. 2A–C). Average fruit intake was higher in older age groups. Only slight decreases over time were observed for ages 35–64 (-7 to -10%; Figs. 2D–L).

#### **Legumes**

Legume intake increased between 2003 and 2023 (all individuals: +10%; women: +12%; men: +8%), especially since 2011 (Figs. 3A–C). The groups that showed the greatest increases were ages 1–4 (+20%) and those aged over 55 (+14 to 20%) (Figs. 3D–L).

#### **Bread, flours, breakfast cereals, pasta, rice, and potatoes**

Bread, flours, and breakfast cereal intake decreased from 99 to 85 g/day (2003–2023, -13%, Fig. 4A), with similar changes in women and men (Figs. 4B–C) and across all ages (Figs. 4D–L). Intake of pasta, rice, and potatoes also decreased from 77 to 68 g/day (2003–2023, -11%) in all participants (women: -12%; men: -10%, Figs. 5A–C), with

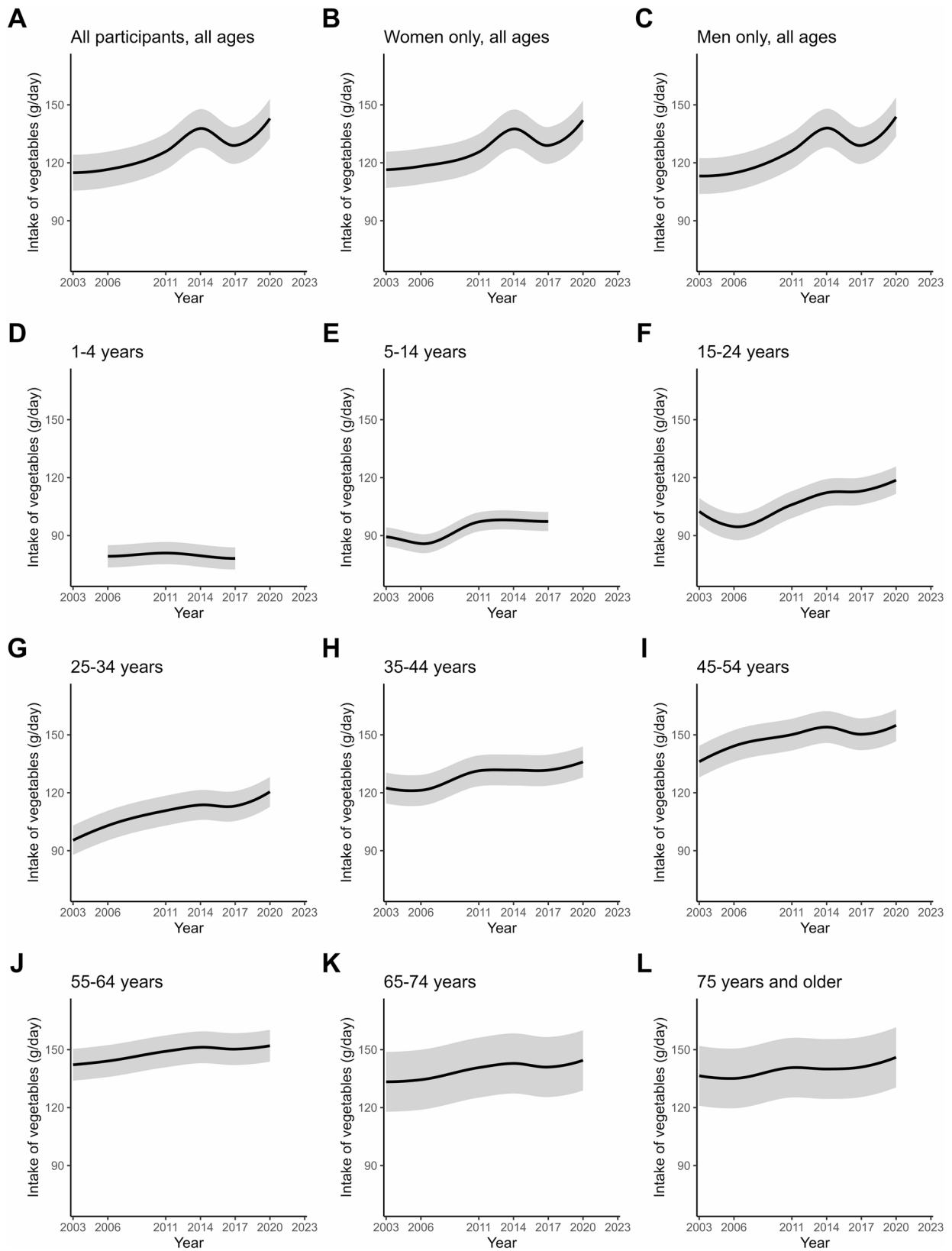


Fig. 1 Intake of vegetables (g/day, 2003–2020)

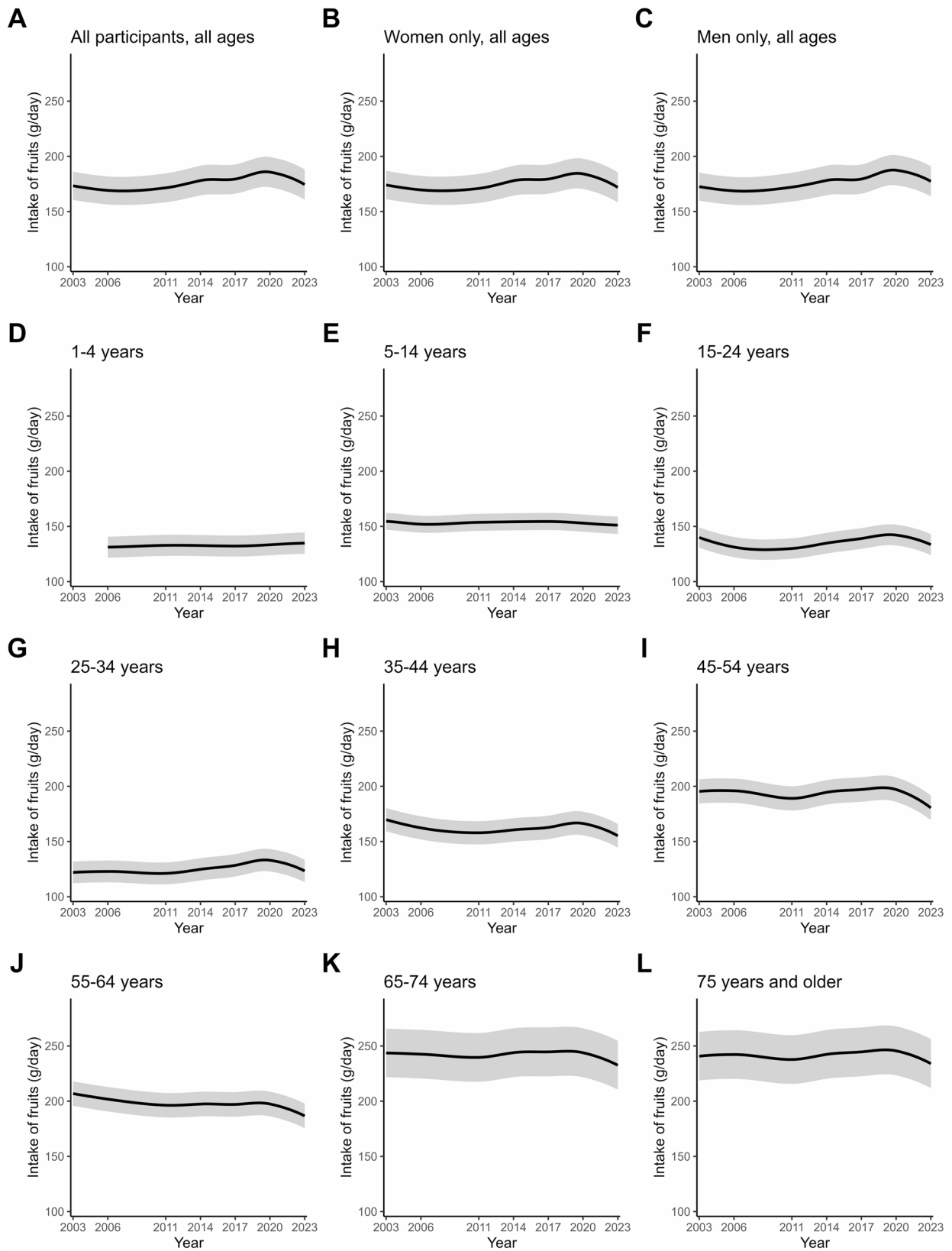
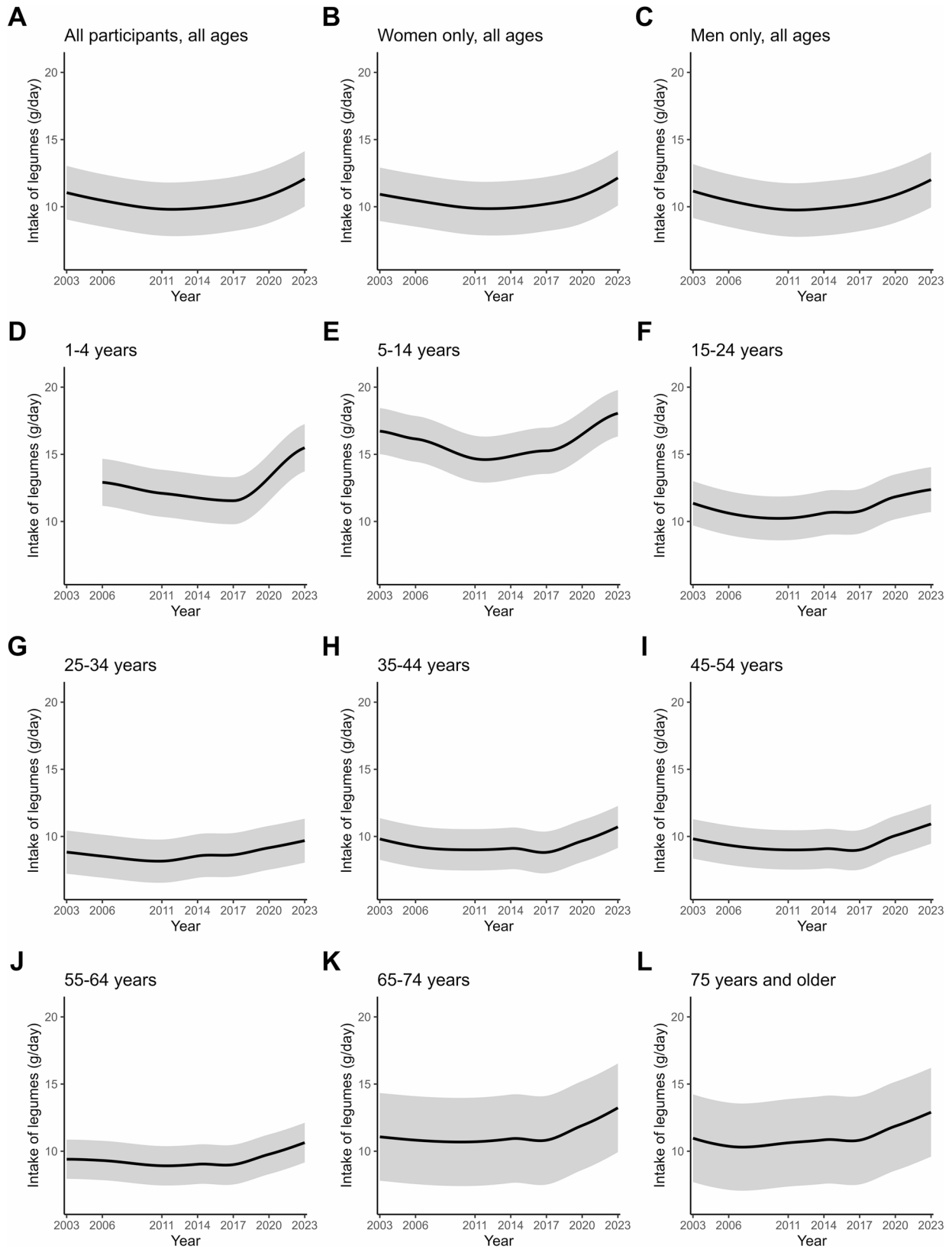
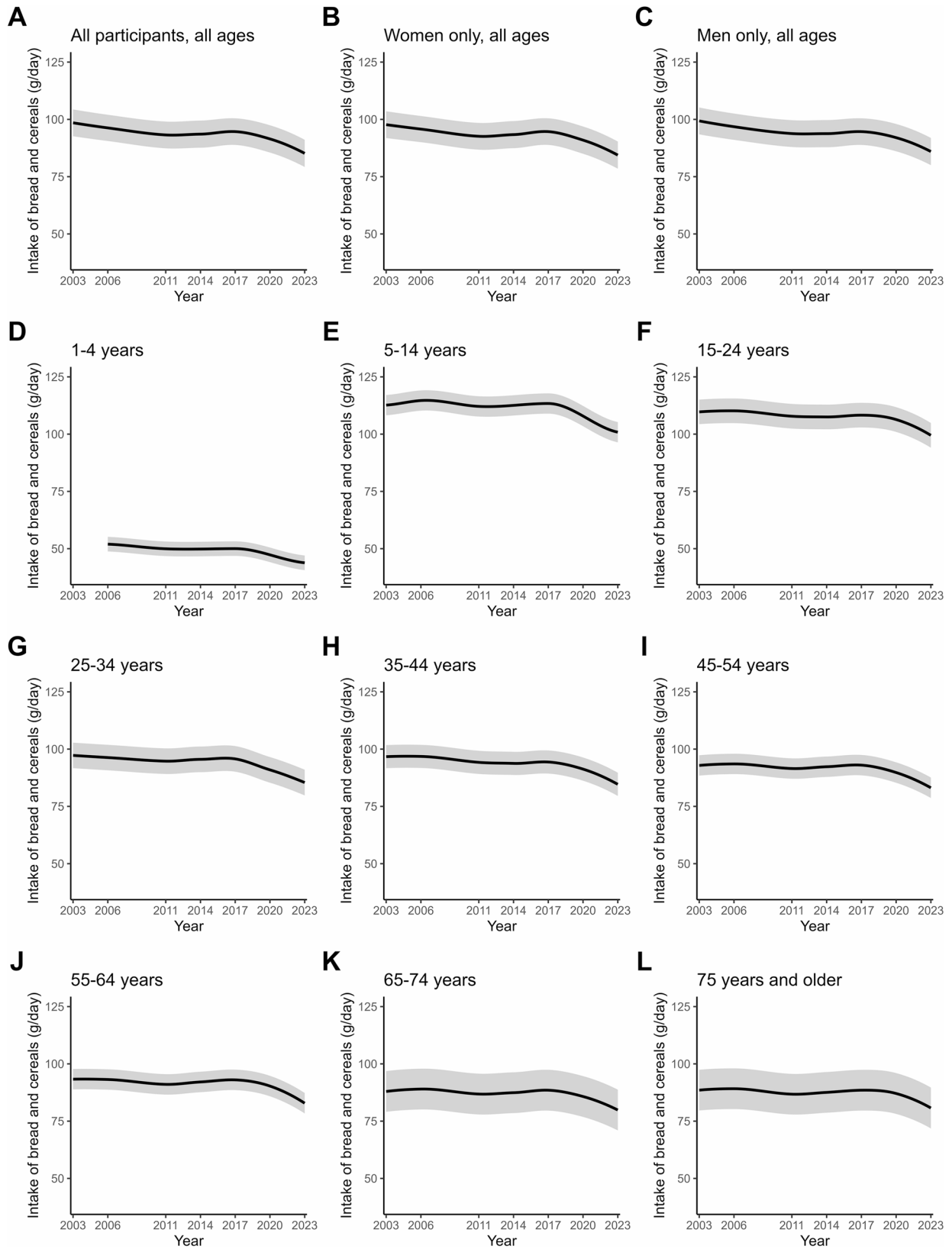


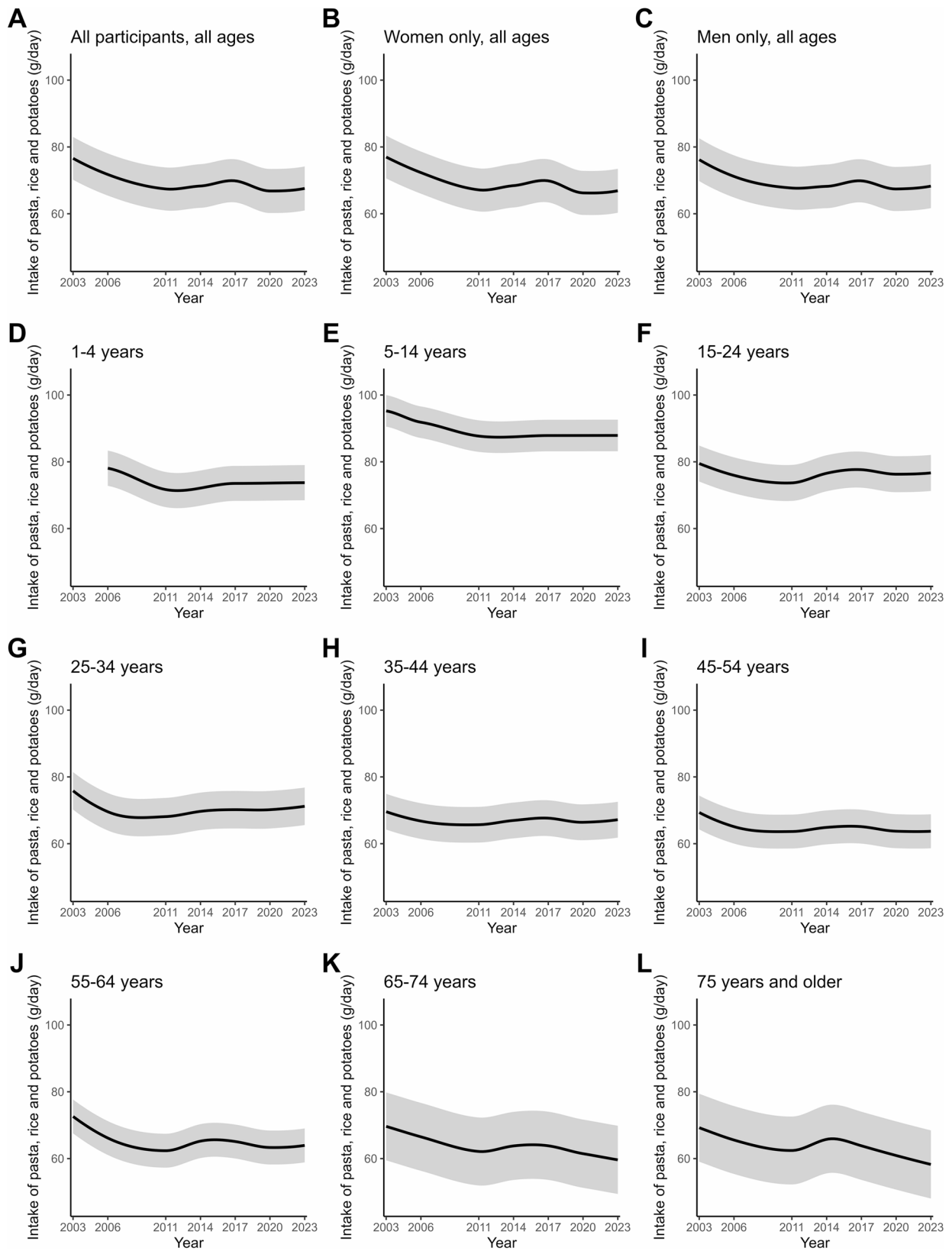
Fig. 2 Intake of fruits (g/day, 2003–2023)



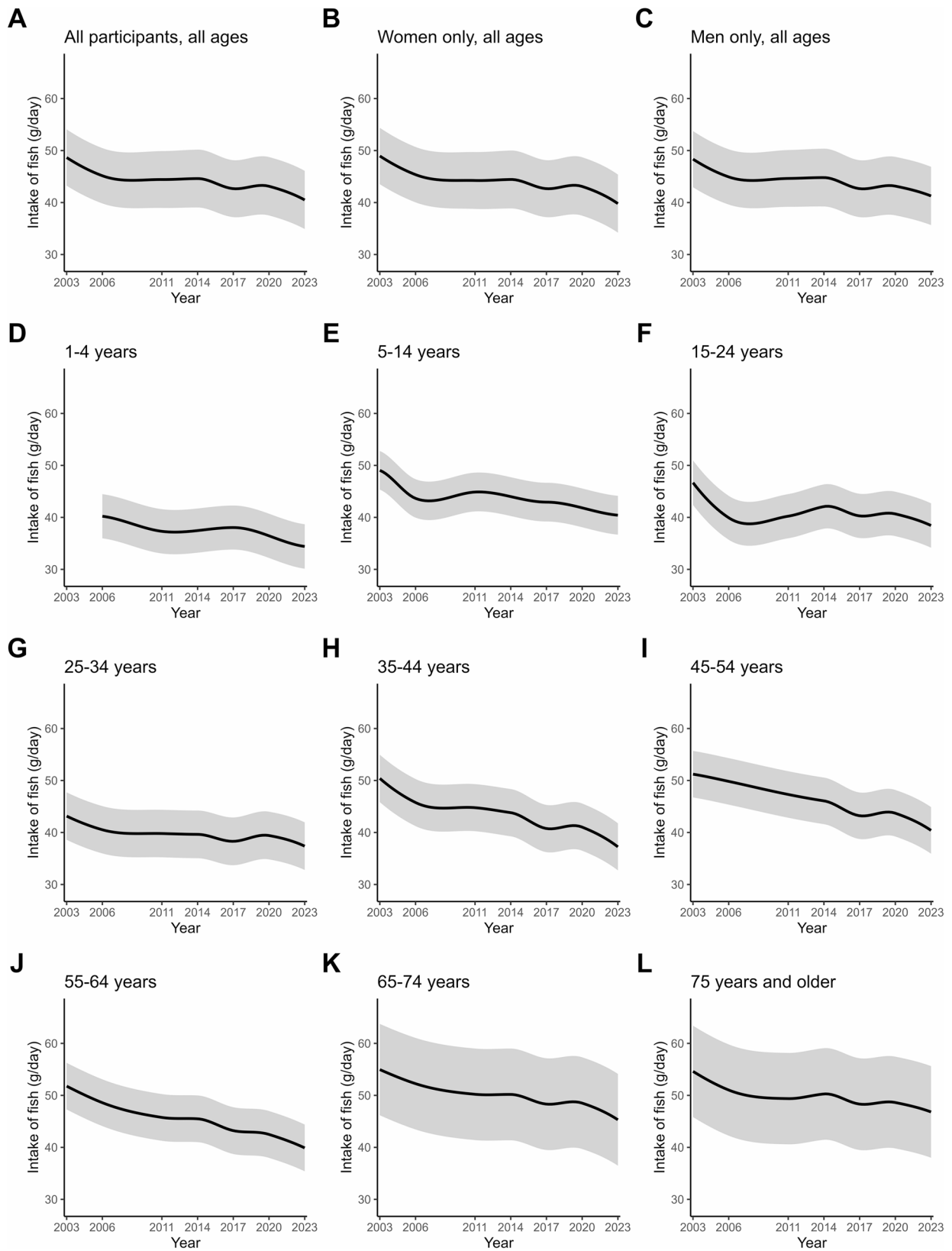
**Fig. 3** Intake of legumes (g/day, 2003–2023)



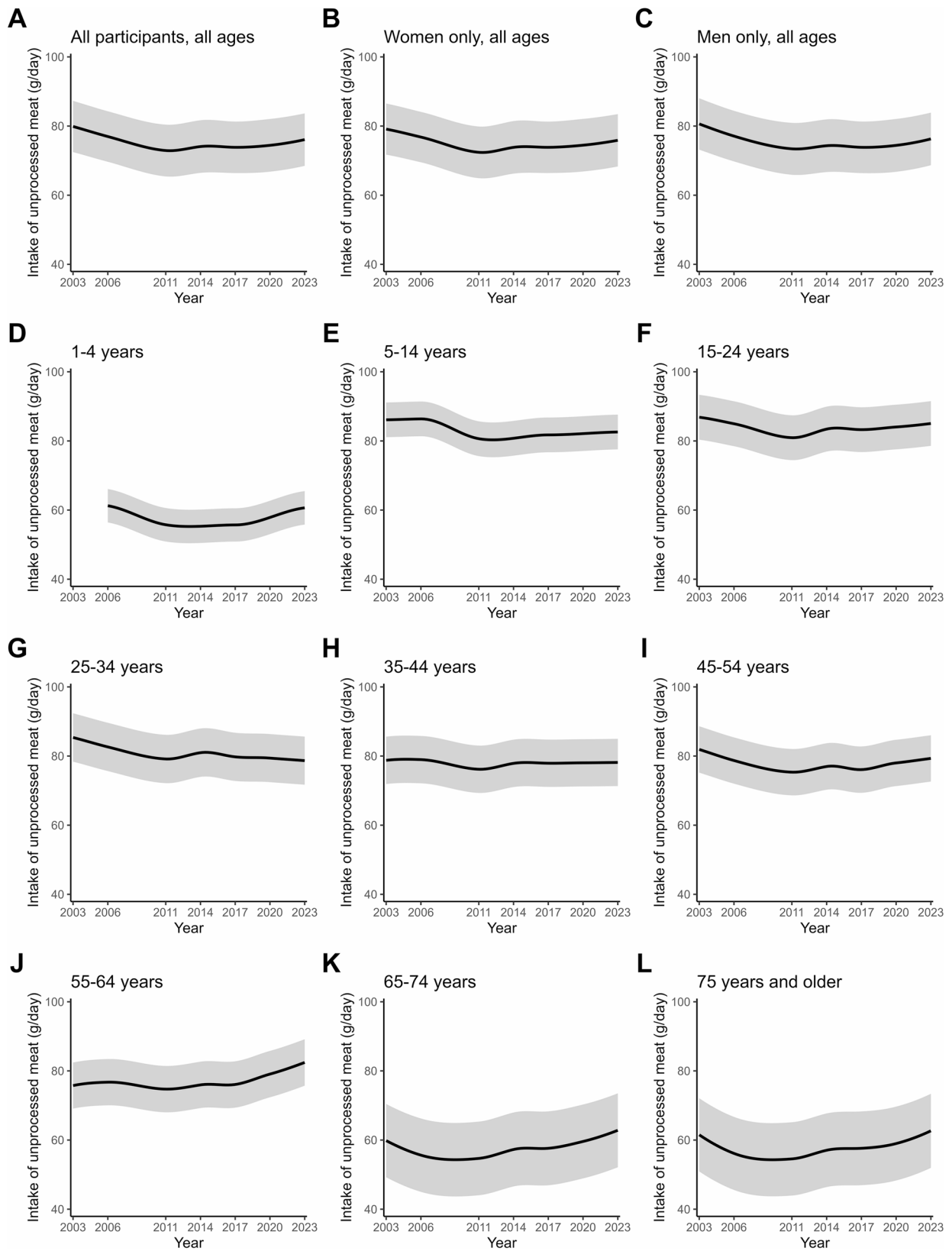
**Fig. 4** Intake of bread and cereals (g/day, 2003–2023)



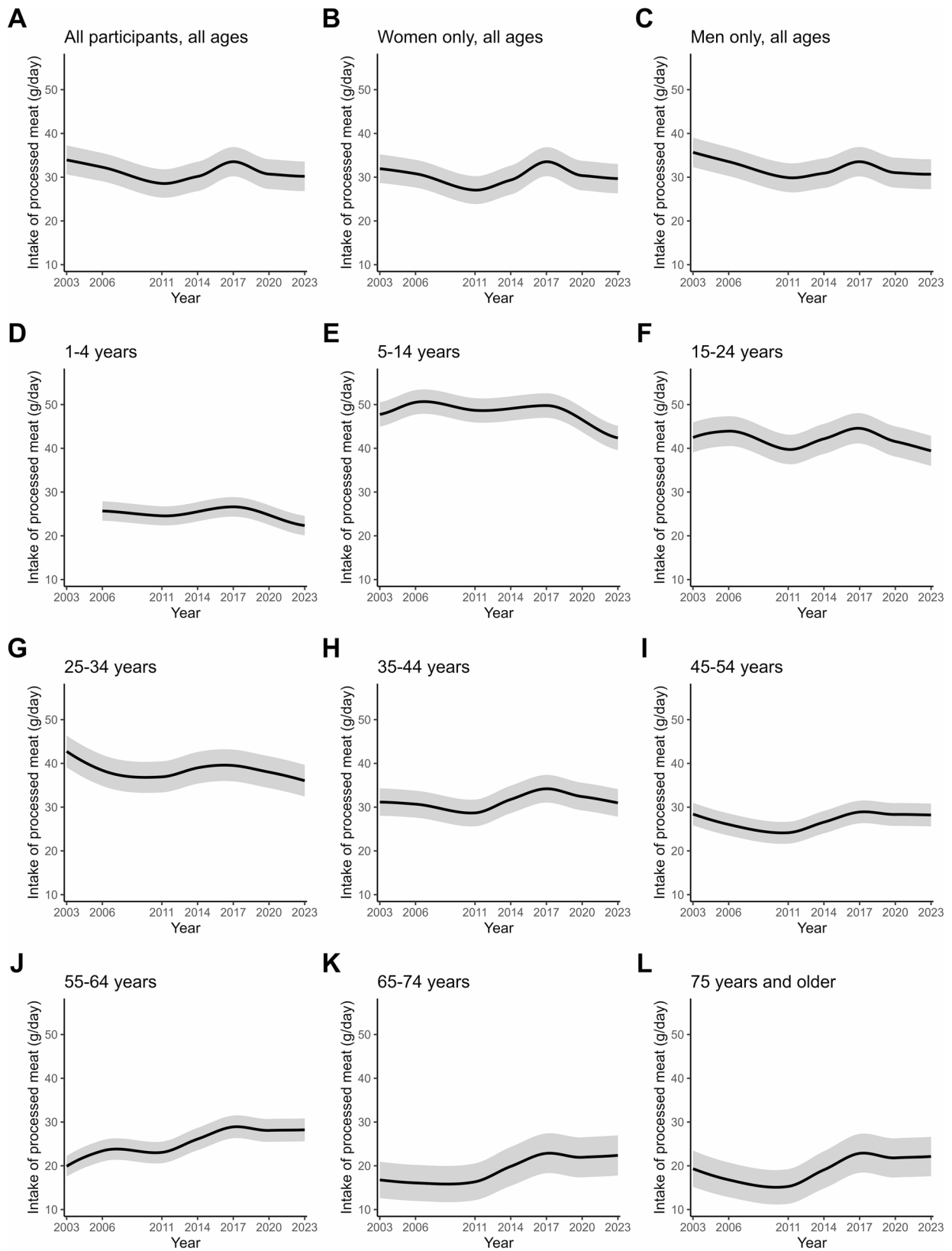
**Fig. 5** Intake of pasta, rice, and potatoes (g/day, 2003–2023)



**Fig. 6** Intake of fish (g/day, 2003–2023)



**Fig. 7** Intake of unprocessed meat (g/day, 2003–2023)



**Fig. 8** Intake of processed meat (g/day, 2003–2023)

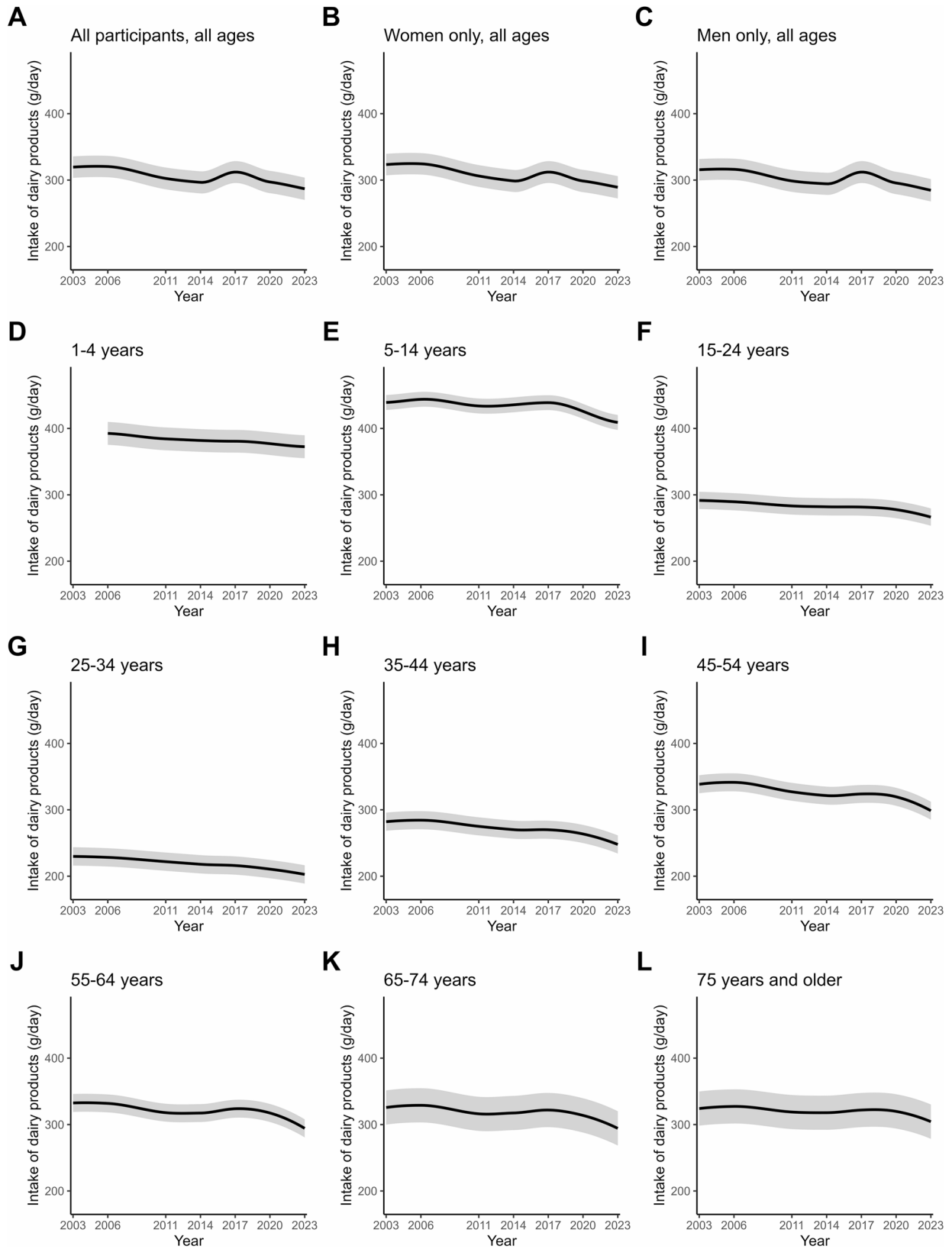
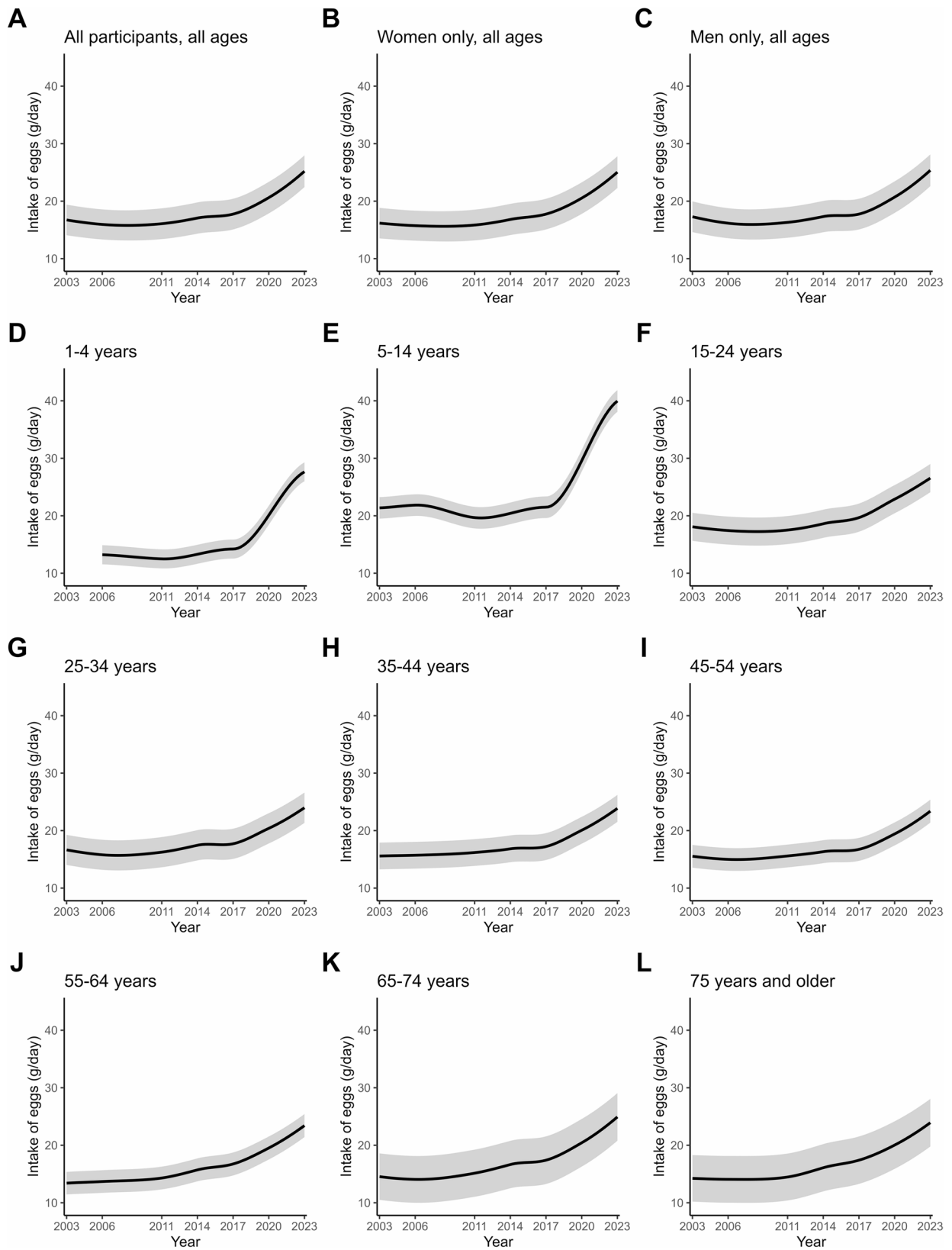
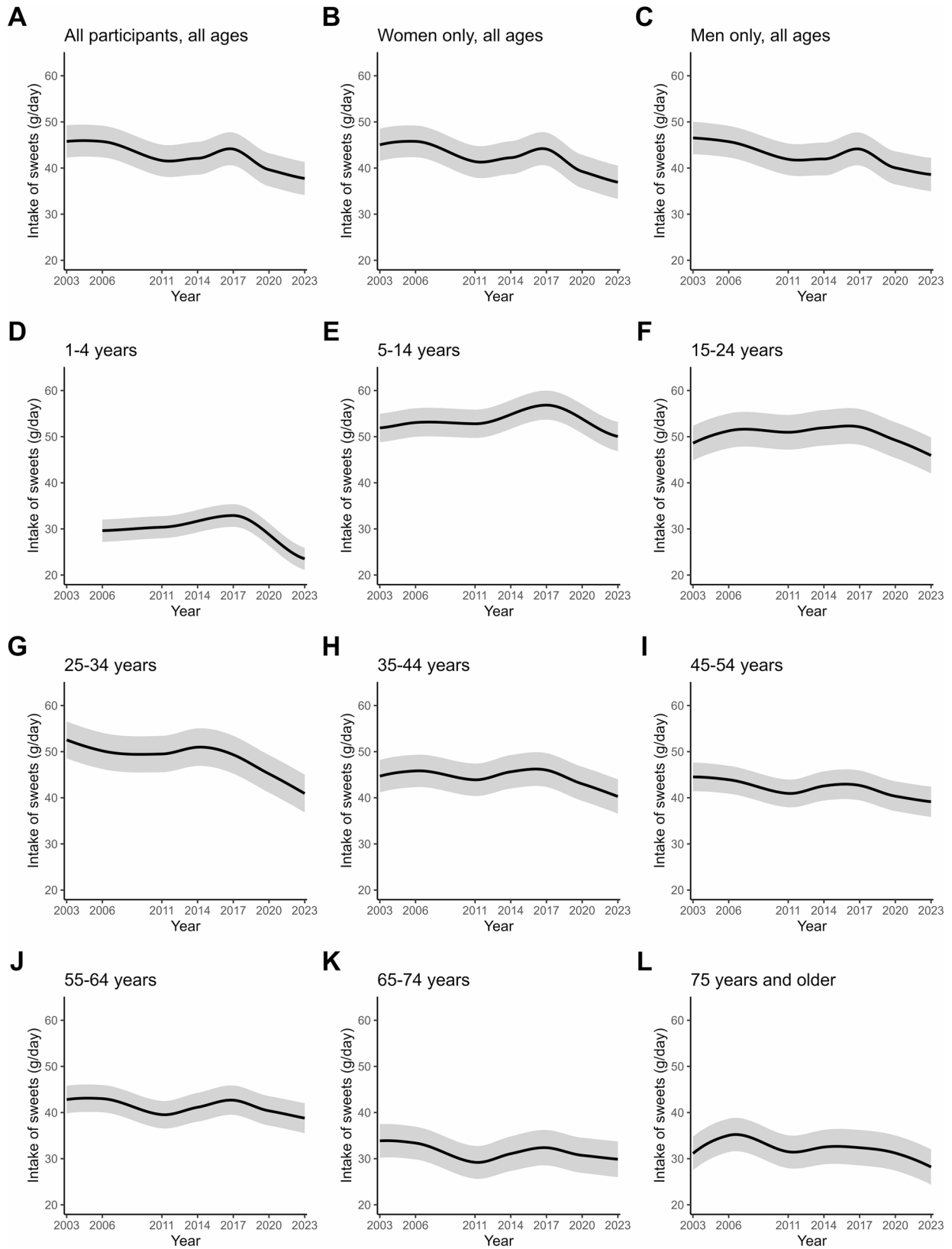


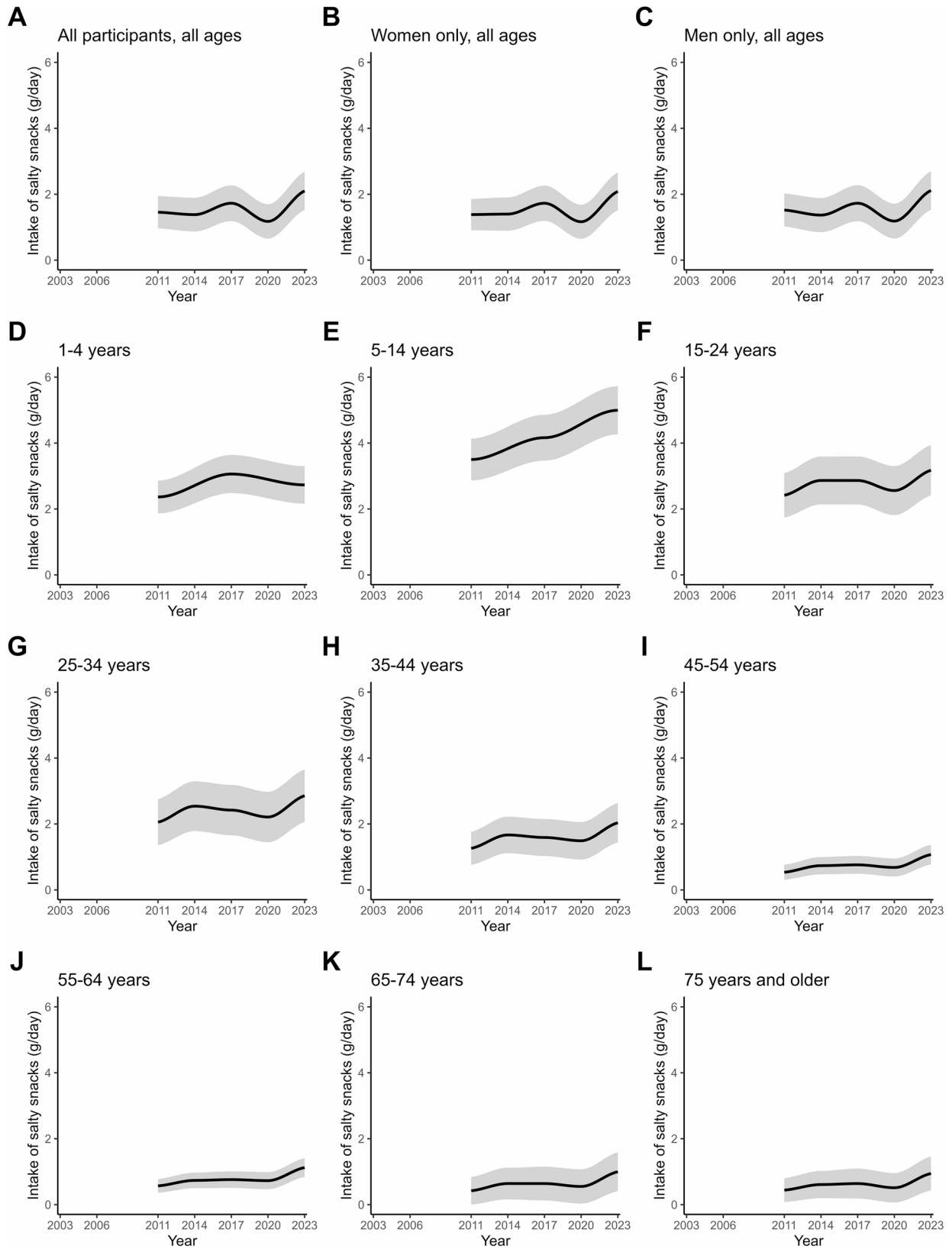
Fig. 9 Intake of dairy products (g/day, 2003–2023)



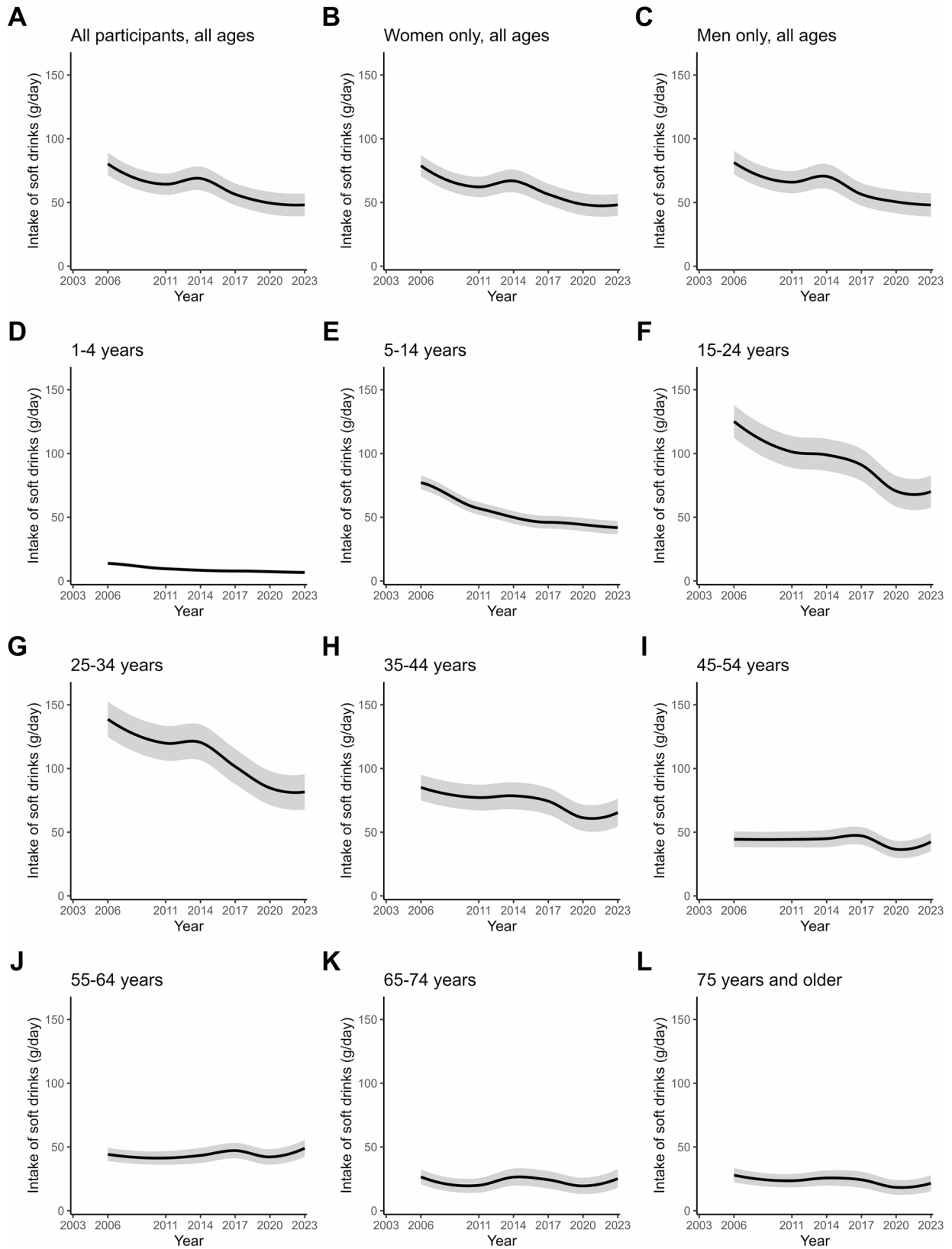
**Fig. 10** Intake of eggs (g/day, 2003–2023)



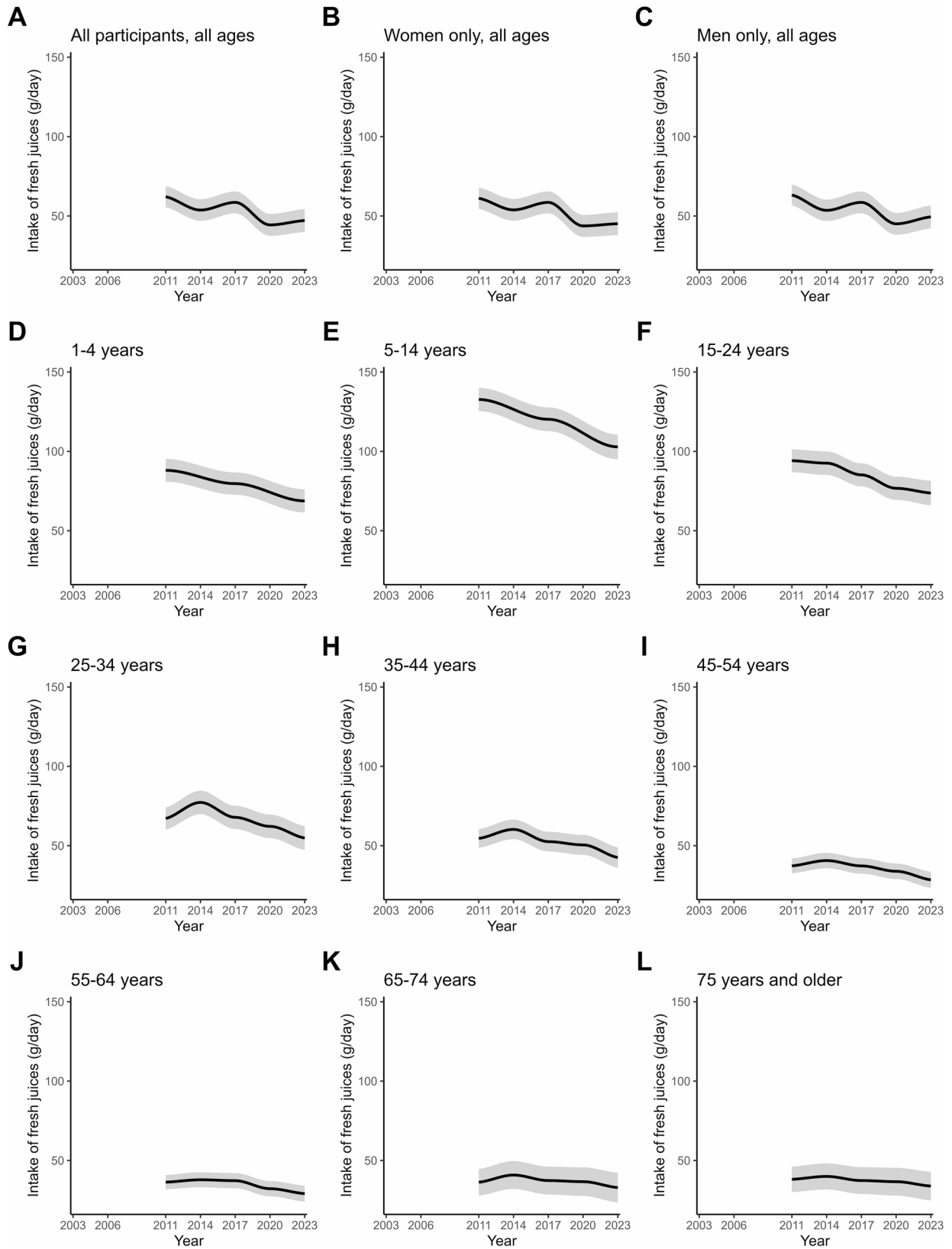
**Fig. 11** Intake of sweets (g/day, 2003–2023)



**Fig. 12** Intake of salty snacks (g/day, 2011–2023)



**Fig. 13** Intake of soft drinks (g/day, 2006–2023)



**Fig. 14** Intake of fresh juices (g/day, 2011–2023)

**Table 1** Changes in food intake over time (all individuals, women and men, and age groups)

	Veg- etables (2003– 2020)	Fruits (2003– 2023)	Legumes (2003– 2023)	Bread, flours and break- fast cereals (2003–2023)	Pasta, rice and potatoes (2003–2023)	Fish (2003– 2023)	Unpro- cessed meat (2003–2023)	Processed meat (2003–2023)	Dairy (2003– 2023)	Eggs (2003– 2023)	Sweets (2003– 2023)	Snacks (2011– 2023)	Soft drinks (2006– 2023)	Fresh juices (2011– 2023)
All	+25%	0%	+10%	-13%	-11%	-18%	-4%	-9%	-10%	+51%	-16%	+44%	-40%	-24%
Women	+22%	-2%	+12%	-13%	-12%	-19%	-4%	-4%	-10%	+56%	-16%	+51%	-39%	-26%
Men	+27%	+2%	+8%	-13%	-10%	-15%	-5%	-12%	-9%	+47%	-16%	+39%	-41%	-22%
1–4 years	-1%	+3%	+20%	-16%	-6%	-15%	-1%	-13%	-5%	+109%	-21%	+16%	-52%	-22%
5–14 years	+9%	-2%	+8%	-11%	-8%	-18%	-4%	-11%	-7%	+87%	-4%	+43%	-46%	-23%
15–24 years	+16%	-5%	+9%	-9%	-3%	-19%	-1%	-5%	-9%	+47%	-5%	+32%	-44%	-22%
25–34 years	+26%	+1%	+10%	-12%	-6%	-14%	-7%	-15%	-12%	+44%	-22%	+39%	-41%	-18%
35–44 years	+11%	-9%	+9%	-12%	-3%	-27%	0%	+2%	-12%	+54%	-9%	+62%	-23%	-22%
45–54 years	+14%	-7%	+11%	-10%	-8%	-22%	-3%	+1%	-12%	+50%	-11%	+100%	-5%	-24%
55–64 years	+7%	-10%	+14%	-11%	-11%	-23%	+9%	+47%	-11%	+76%	-8%	+98%	+11%	-20%
65–74 years	+8%	-4%	+20%	-9%	-14%	-18%	+5%	+37%	-9%	+72%	-10%	+137%	-5%	-9%
75 +years	+7%	-3%	+17%	-9%	-15%	-15%	+2%	+18%	-6%	+70%	-7%	+114%	-23%	-11%

the sharpest declines in ages 55 and older (-11 to -15%) (Figs. 5D-L).

**Fish**

Fish intake declined from 49 to 40 g/day (2003–2023, -18%), similarly in women (-19%) and men (-15%; Figs. 6A-C). Although fish consumption was higher in the older population, it declined in all age groups (Figs. 6D-L).

**Unprocessed and processed meat**

Unprocessed meat intake decreased from 80 to 76 g/day (2003–2023, -4%), similarly in women and men (Figs. 7A-C) and in most age groups. Conversely, intake increased in ages 55–64 (+9%), 65–74 (+5%), and 75 and older (+2%) (Fig. 7J-L). Processed meat intake decreased from 34 to 31 g/day (2003–2023, -9%, Fig. 8A). Men consumed more in 2003 but decreased intake more in 2023 (women: -4%; men: -12%; Figs. 8B-C). The greatest decreases were observed in ages 1–34 (-5 to -15%, Figs. 8D-G; ages 5–34 showed the highest consumption in 2003). By contrast, processed meat intake increased in ages 55–64 (+47%, Fig. 8J), 65–74 (+37%, Fig. 8K), and 75 or older (+18%, Fig. 8L).

**Dairy products and eggs**

Dairy intake declined from 320 to 290 g/day (2003–2023, -10%), similarly in women and men (Figs. 9A-C) and across all ages (Figs. 9D-L). Egg intake increased from 17 to 25 g/day (2003–2023, +51%), similarly in women (+56%) and men (+47%; Figs. 10A-C), and across all age groups (+44 to +109%, Figs. 10D-L).

**Sweets and salty snacks**

Sweets intake decreased from 46 to 38 g/day (2003–2023, -16%; Figs. 11A-C). The highest average intake of sweets was observed in ages 5–14 (50–55 g/day) and increasingly lower in older age groups. The greatest decreases over time were observed for ages 1–4 (-21%) and 25–34 (-22%) (Figs. 11D-L). Regarding snack intake, it remained at very low levels (~1–2 g/day) but increased substantially over time (all individuals: +44%, women: +51%; men: +39%; Figs. 12A-C). The highest average intake was also observed in ages 5–14 (3.5–5.0 g/day) and increasingly lower in older age groups. All age groups showed increases in the intake of salty snacks, although the increases were particularly large for those groups with very low intakes in the first year with data (2011), such as ages 45–54 (+100%, from 0.53 to 1.07 g/day), 55–64 (+98%, from 0.57 to 1.12 g/day), 65–74 (+137%, from 0.42 to 1.00 g/day), and 75 or older (+114%, from 0.44 to 0.94 g/day) (Figs. 12D-L).

### Soft drinks and fresh juices

Soft drink consumption declined from 80 to 48 g/day (2006–2023, -40%), similarly in women (-39%) and men (-41%; Figs. 13A–C). In 2006, it peaked among ages 15–34 (125–139 g/day), versus ~25 g/day for ages 65 or older. The largest declines were seen in ages 1–34 (-41 to -52%) (Figs. 13D–L). Fresh juice consumption also decreased from 62 to 47 g/day (2011–2023, -24%), similarly in women (-26%) and men (-22%; Figs. 14A–C). Consumption peaked in ages 5–14 (103–133 g/day) and decreased with age. Similar declines over time were observed in all age groups (Figs. 14D–L).

### Differences by country of origin and social class

Individuals not born in Spain increased their intake of vegetables and legumes less than those born in Spain (vegetables: born in Spain +16%, not born in Spain +7%; legumes: born in Spain +15%, not born in Spain +9%), reduced their fish intake less (born in Spain -12%, not born in Spain -5%), and reduced their intake of unprocessed meat, sweets, and soft drinks more (meat: born in Spain 0%, not born in Spain -15%; sweets: born in Spain -13%, not born in Spain -24%; soft drinks: born in Spain -32%, not born in Spain -54%). In contrast, evolution of food group intake was similar across social class groups (Supplementary Table 6, Supplementary Figs. 1–14).

### Discussion

While consumption of vegetables, legumes, eggs, and salty snacks increased among the Spanish population between 2003 and 2023, intake of soft drinks, juices, sweets, fish, dairy products, starchy foods (bread, flours, breakfast cereals, pasta, rice, and potatoes), and processed meat declined. These changes were similar between women and men and across social class groups. By contrast, adults aged 25–34 and people not born in Spain experienced more favorable trends, whereas adults aged  $\geq 55$  years and children and adolescents aged 5–14 showed more detrimental ones.

Our findings suggest an overall improvement in several dietary behaviors in Spain. Rising vegetable and legume intakes have been recently observed in other European countries [5] and are encouraging, as they are linked to a lower risk of all-cause mortality [20]. Decreasing intakes of soft drinks, sweets, and processed meat have also been observed in other European countries [5] and are likewise related to lower all-cause mortality [20]. The decline in fish consumption, given its association with a lower incidence of chronic disease, could be concerning [21]; however, fish intake in 2023 still aligns with the Spanish food-based dietary guidelines [22], and the trend may be offset by evidence suggesting that sustainable diets with lower animal-product intake (including fish and dairy)

are protective [23]. The concurrent rise in egg consumption may reflect compensation for reduced consumption of other animal proteins, as eggs are a cheaper, nutritious and more sustainable source [24]. These trends emphasize the need to promote balanced protein sources and plant-based foods to support optimal health outcomes [23–25]. Nonetheless, several absolute intakes remain misaligned with the Spanish food-based dietary guidelines [22]: vegetable and fruit consumption fall below the 300 and 350 g/day targets; legumes barely reach two weekly servings (whereas at least three are recommended); total meat exceeds the  $\leq 300$ –375 g/week limit; and discretionary items (salty snacks, sweets, soft drinks) are still consumed in substantial amounts.

We found only minor differences between women and men in dietary trends over time, consistent with a recent study [26]. Similarly, differences across social classes were small, mirroring previous evidence showing that although baseline diet is healthier in higher socioeconomic groups, the direction and magnitude of change over time are largely parallel [27]. Nevertheless, our results revealed marked differences among age groups. Individuals aged 25–34 exhibited dietary patterns far from recommendations (the lowest intakes of fruits, vegetables, legumes, and fish, and the highest intakes of meat, sweets, snacks, and soft drinks), yet showed the greatest improvement from 2003 to 2023 in vegetables, processed meat, soft drinks, and sweets. Although trends in younger adults were favorable, substantial room for improvement remains: targeted public health interventions are needed [28] because non-adherence to a healthy diet remains worryingly high. By contrast, although older adults consume more vegetables, fruits, and legumes and less processed meats, sweets, snacks and soft drinks (diet quality generally increases with age [29]), the dietary habits of those aged  $\geq 55$  deteriorated over time in our data. We observed smaller improvements in vegetable, sweet, and soft-drink intake and substantial increases in unprocessed/processed meat and salty snacks, echoing findings from other Western countries [30, 31]. Children and adolescents aged 5–14 represented another group with marked deviations from guidelines and unfavorable trends. Vegetable intake remained low and did not increase in the last years, and they consumed the most sweets (with modest reductions in their intake), processed meats, salty snacks, and juices. This stagnation or worsening of the dietary habits aligns with previous evidence and could be partially explained by parental unawareness [32, 33]. It underscores the need for nutrition promotion programs in children and adolescents, building on recent successful initiatives [34–36]. Finally, foreign-born individuals experienced more favorable dietary trends than Spanish-born counterparts (smaller declines in fish intake and greater reductions in

unprocessed meat, sweets, and soft drinks, despite only moderate gains in vegetables and legumes). These findings align with previous studies in Latin American and West African communities in Spain [37–39], and may be useful for equity-oriented nutrition planning, as they indicate whether dietary trajectories differ by nativity and may warrant culturally adapted prevention strategies.

Several societal and policy developments in Spain during 2003–2023 may help contextualize our findings. Population ageing and the large immigration inflows of the 2000s reshaped the population structure, and evidence from Spain indicates that dietary profiles differ between immigrant and native groups, with potential acculturation over time [40, 41]. The economic crisis reinforced price sensitivity in food choice, possibly driving changes in food expenditure such as a potential substitution of fish and meat products with cheaper protein sources such as eggs [42]. Regarding the decreases in soft drinks and juices and the increases in vegetable and legume intake, these changes could be explained by several concomitant factors: a broader policy and food-environment agenda that intensified from the mid-2000s onward (NAOS strategy), co-/self-regulatory and legal frameworks (PAOS code; Law 17/2011 on Food Safety and Nutrition), expanded nutrition information availability (mandatory EU nutrition declaration from December 2016), the introduction of front-of-pack labeling (Nutri-Score, announced in 2018), and some local initiatives such as the Catalonia tax on sugar-sweetened beverages (2017) [43–48]. The decline in sweets among children (ages 1–4 and 5–14) from 2020 onward could reflect, at least in part, the heightened policy attention to unhealthy food marketing and childhood obesity around 2021–2022 [49], although we interpret this cautiously given concurrent pandemic-related disruptions in food habits. Finally, the rise in snack intake agrees with reports suggesting increases in the consumption of ultra-processed foods, and the steeper increase from 2020 onwards is consistent with evidence linking COVID-19 restrictions to increased snacking and higher ultra-processed food consumption [50, 51].

Our study has some limitations. First, analyses were limited to data from 2003 onwards, preventing assessment of earlier trends. Second, SHS and EHSS intake data were not available for all food groups or subpopulation throughout the series (e.g., the 2003 SHS combined ages 1–15, which we reassigned to those aged 5–14, leaving ages 1–4 without data; the 2003 SHS lacked information on country of birth; the 2023 SHS data on vegetable intake lacked some age groups and were excluded; and data on salty snacks, fresh juices, and soft drinks were missing in early waves). Furthermore, discrepancies exist between the 2003/2006 SHS and subsequent surveys in the definition of “fruit intake” (which initially included

fresh juices until these were categorized separately in 2011), in the classification of social classes III and IV, and in interview methodology (face-to-face in 2003/2006 versus computer-assisted personal or telephone interviews thereafter), which may lead to some inconsistencies. Third, we could not assess trends in fast food intake (one of the food groups investigated in the SHS and EHSS surveys) because ENALIA/ENALIA-2 lacked compatible data. Fourth, regarding older adults, institutionalized individuals were excluded from SHS and EHSS, which might lead to selection bias if the dietary patterns of this subgroup differ substantially from those living in private households. In addition, ENALIA-2 assessed only ages 18–74; we therefore extrapolated intake for those  $\geq 75$  from the 65–74 group, which may be imprecise. Fifth, the approximation of age groups during infancy, although it was generated to allow for comparability over time, may not fully reflect actual homogeneous age groups regarding consumption patterns. Sixth, we were unable to conduct analyses comparing income levels, and we were only able to compare social classes based on occupation and Spanish-born vs. foreign-born individuals as sociodemographic determinants, because this information was unavailable across SHS and EHSS surveys. Seventh, there may be mismatches in the estimation of intake for subpopulations that involved all age groups between SHS and EHSS data because SHS investigated all ages and EHSS only focused on individuals aged  $\geq 15$ . Eighth, most data were self-reported, which may introduce errors due to recall bias, social desirability bias, and under-reporting or over-reporting. Finally, some food groups were broad, potentially masking important distinctions (e.g., whole vs. refined grains; full-fat vs. low-fat dairy; types of dairy products, unprocessed meat, and snacks).

## Conclusions

This is the first comprehensive analysis of trends of food group consumption in Spain using nationally representative data, covering women and men, different age groups and different social determinants. Our findings reveal increases in vegetables and legumes, reductions in soft drinks and juices, processed meats, and sweets, and a decline in fish intake. Although differences between women and men and among social classes were minimal, the greatest improvements occurred in adults aged 25–34 and in foreign-born individuals, whereas the most pronounced deteriorations were seen in adults aged  $\geq 55$  and children and adolescents aged 5–14. These findings underscore the need to reinforce positive trends through targeted interventions. Future research should assess the long-term health outcomes associated with these evolving dietary habits. Our data can inform policy, guiding more impactful, evidence-based nutritional strategies.

## Abbreviations

ENALIA	Encuesta Nacional de Alimentación en la población Infantil y Adolescente
ENALIA-2	Encuesta Nacional de Alimentación en población adulta, mayores y embarazadas
EHSS	European Health Survey in Spain
SHS	Spanish Health Survey

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12937-026-01287-w>.

Supplementary Material 1.

## Authors' contributions

S.B. was responsible for data curation, formal analyses, data interpretation, and drafting the article. E.C.-Á. contributed to formal analyses and data interpretation and revised the article critically. M.H.H. contributed to data interpretation and revised the article critically. C.L. contributed to data interpretation and revised the article critically. S.C.-B. contributed to data interpretation and revised the article critically. K.P.-V. contributed to data interpretation and revised the article critically. O.C. contributed to data interpretation and revised the article critically. A.M. contributed to data interpretation and revised the article critically. V.S. contributed to data interpretation and revised the article critically. M.D.Z. contributed to data interpretation and revised the article critically. B.S.-R. contributed to data interpretation and revised the article critically. B.C. contributed to data interpretation and revised the article critically. A.O.-R. contributed to data interpretation and revised the article critically. J.M. contributed to data interpretation and revised the article critically. M.R.-M. contributed to data interpretation and revised the article critically. R.M. contributed to data interpretation and revised the article critically. E.V.-G. contributed to data interpretation and revised the article critically. P.G. contributed to data interpretation and revised the article critically. C.M. contributed to data interpretation and revised the article critically. I.P.-L. contributed to data interpretation and revised the article critically. M.F. contributed to data interpretation and revised the article critically. Á.H. coordinated the project, conceived and designed the study, contributed to data representation and interpretation, and critically revised the article. Á.H. is the guarantor of this study, accepts full responsibility for the work and the conduct of the study, has access to the data, and controlled the decision to publish.

## Funding

This work was supported by the European Commission (Marie Curie-Sklodowska Actions HORIZON-MSCA-2024-PF-01, grant number 101201060), the Government of Catalonia (grant number 2021 SGR 00144), Instituto de Salud Carlos III (grant number PI24/00182) and co-funded by the European Union. Open Access funding was provided by the Blanquerna School of Health Sciences, University Ramon Llull. The funders had no role in the study design; the collection, analysis, and interpretation of data; in the writing of the report; or in the decision to submit the article for publication.

## Data availability

SHS and EHSS data were downloaded from the Instituto Nacional de Estadística website in the following links: <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/p02/a2003/10/%26file=02123.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/p02/a2003/10/%26file=02127.px%26L=0> (SHS, 2003); <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/a2006/p03/10/%26file=03105.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/a2006/p03/10/%26file=03106.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/a2006/p03/10/%26file=03108.px%26L=0> (SHS, 2006); <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/a2011/p03/10/%26file=03160.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/a2011/p03/10/%26file=03161.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/a2011/p03/10/%26file=03162.px%26L=0> (SHS, 2011); <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p420/a2014/p03/10/%26file=05001.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p420/a2014/p03/10/%26file=05002.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p420/a2014/p03/10/%26file=05003.px%26L=0> (EHSS, 2014); [https://www.ine.es/jaxi/Tab](https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/a2017/p03/10/%26file=06006.px%26L=0)

[la.htm?path=/t15/p419/a2017/p03/10/%26file=06007.px%26L=0](https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/a2017/p03/10/%26file=06007.px%26L=0); <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p419/a2017/p03/10/%26file=06008.px%26L=0> (SHS, 2017); <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p420/a2019/p03/10/%26file=05001.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p420/a2019/p03/10/%26file=05002.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p420/a2019/p03/10/%26file=05002.px%26L=0>; <https://www.ine.es/jaxi/Tabla.htm?path=/t15/p420/a2019/p03/10/%26file=05003.px%26L=0> (EHSS, 2020); and <https://www.ine.es/jaxi/Tabla.htm?tpx=72471%26L=0> (SHS, 2023). ENALIA and ENALIA-2 data were downloaded from the Agencia Española de Seguridad Alimentaria y Nutrición website in the following links: [https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad\\_alimentaria/evaluacion\\_riesgos/Consumo\\_12\\_36\\_meses.pdf](https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad_alimentaria/evaluacion_riesgos/Consumo_12_36_meses.pdf) (ages 1-3); [https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad\\_alimentaria/evaluacion\\_riesgos/Consumo\\_3\\_9\\_anios.pdf](https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad_alimentaria/evaluacion_riesgos/Consumo_3_9_anios.pdf) (ages 4-9); [https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad\\_alimentaria/evaluacion\\_riesgos/Consumo\\_10\\_17\\_anios.pdf](https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad_alimentaria/evaluacion_riesgos/Consumo_10_17_anios.pdf) (ages 10-17); [https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad\\_alimentaria/evaluacion\\_riesgos/Edades\\_18\\_39.pdf](https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad_alimentaria/evaluacion_riesgos/Edades_18_39.pdf) (ages 18-39); [https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad\\_alimentaria/evaluacion\\_riesgos/Edades\\_40\\_64.pdf](https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad_alimentaria/evaluacion_riesgos/Edades_40_64.pdf) (ages 40-64); and [https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad\\_alimentaria/evaluacion\\_riesgos/Edades\\_65\\_74.pdf](https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad_alimentaria/evaluacion_riesgos/Edades_65_74.pdf) (ages 65-74). The fully documented codebase is available at [https://github.com/alvarohernaez/food\\_groups\\_evolution](https://github.com/alvarohernaez/food_groups_evolution).

## Declarations

### Ethics approval and consent to participate

The study relied solely on previously published, publicly available data; therefore, ethics approval was not required. Participants in the dietary surveys from which the data were drawn had already provided informed consent for the original studies.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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Received: 17 June 2025 / Accepted: 24 January 2026

Published online: 04 February 2026

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