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The NORBAGREEN 2002 study

Consumption of vegetables, potatoes, fruit, bread and fish in the Nordic and Baltic countries

NORDIC COUNCIL OF MINISTERS FOOD



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The Nordic Food Policy Co-operation

The Nordic Committee of Senior Officials for Food Issues is concerned with basic Food Policy issues relating to food and nutrition, food toxicology and food microbiology, risk evaluation, food control and food legislation. The co-operation aims at protection of the health of the consumer, common utilisation of professional and administrative resources and at Nordic and international developments in this field.

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Preface

The NORBAGREEN project (Consumption of vegetables and fruit and other dietary health indicator foods in the Nordic and the Baltic countries) was started in the year 2001. It was a follow-up project of the work done by the Nordic project group NORDGRÖNT (1996-1998). During the NORDGRÖNT project it had become evident that vegetable and fruit consumption statistics were not comparable across the Nordic countries. The NORDGRÖNT project group proposed an outline for a food frequency questionnaire (FFQ) concerning vegetable, potato and fruit consumption. As a result a validated questionnaire on vegetable and fruit consumption became available. The NORBAGREEN project presented here expanded the scope of monitoring dietary health indicators by

- including the Baltic countries with the Nordic countries in the project (altogether eight countries),
- including a representative subpopulation from Åland, in addition to the sample from mainland Finland,
- including, in addition to vegetables, fruit and berries, also fish and bread consumption in the list of dietary health indicators, as suggested by the EU/EFCOSUM group (Steingrimsdóttir *et al.*, 2002), and
- including potato consumption in the study, in addition to the proposed dietary health indicator foods, as was done in the earlier NORDGRÖNT project.

The aims of the project were to study, with comparable methods, the frequency of consumption of vegetables, potatoes, fruit, bread, and fish in the Nordic and the Baltic countries including Åland, and to produce and formally test a FFQ for this purpose. This publication reports the main results of the study in all countries, for all respondents and for men and women separately.

The project was financed by the Nordic Council of Ministers. Additional support for the project was obtained from the Norwegian Directorate for Health and Social Affairs, the Swedish National Food Administration, the Icelandic Agricultural Production Fund, the Finnish Ministry of Social Affairs and Health, the

Landskapsstyrelse Åland (the government of Åland), as well as Kotimaiset Kasvikset ry./Inhemiska Trädgårdsproducter rf., Finland.

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Lars Johansson, Directorate for Health and Social Affairs, Norway

Lars Ovesen / Sisse Fagt, Veterinary and Food Administration, Denmark

Janina Petkeviciene, Kaunas, University of Medicine, Lithuania

Iveta Pudule, Health Promotion Centre, Latvia

Holmfridur Thorgeirsdottir / Laufey Steingrimsdottir, Icelandic Nutrition Council

Sirje Vaask, Food Processing Institute of Tallinn Technical University, Estonia

Liisa Valsta (co-ordinator of the project), National Public Health Institute (KTL), Finland.

Minna Similä (KTL, Finland) served as a part-time researcher on the project and had main responsibility for analysing the results and writing the report under supervision of the co-ordinator. The data collection interviews were co-ordinated by Taloustutkimus Oy (TOY) Research Finland (Päivi Wennerström and Merja Lintunen), under supervision of the co-ordination centre. The Lithuanian validation study was carried out at the Kaunas University of Medicine under supervision of Janina Petkeviciene, and the Finnish validation study was carried out by the co-ordination centre in conjunction with the FINDIET 2002 Study by KTL, Finland. Elena Moltchanova (KTL, Finland) served as statistical consultant to the project. All country representatives participated at all stages of the study and in the writing and finalising of the report. More detailed contact information for the country representatives is given in Appendix 6.

Summary

The food groups fruit, vegetables, bread and fish have been proposed to be monitored as dietary indicators for health. The lack of food consumption data that are truly comparable across countries is an internationally known problem. The aim of the NORBAGREEN study was to examine the consumption frequency of these foods as well as of potatoes with comparable methods in the Nordic and the Baltic countries, and to produce and validate a food frequency questionnaire (FFQ) for this purpose. The FFQ was modified and expanded from the validated FFQ of the Nordgrönt project (1996-1998). The FFQ contained one global question on total consumption per food group and several questions on the consumption of different preparation forms of vegetables, potatoes and fruit. In addition, it covered the consumption of individual vegetables and fruits, the consumption of fish as a main dish and as a side dish, and the consumption of breads with different levels of fibre content. The questionnaire was applied using Computer Assisted Telephone Interviews (CATI) in the Nordic countries and Paper Assisted Personal Interviews (PAPI) in the Baltic countries. The interviews were co-ordinated by TOY Research (Finland). In total, 8397 interviews were completed (approx. 1000 persons/country, 250 in Åland; age range 15-74 years). The samples were country representative with respect to sex, age and area. It was found that controlling for factors affecting comparability in an international study required careful attention and close collaboration throughout the study process.

The highest average consumption frequencies for the studied foods were found in those countries where these foods are consumed regularly by a large proportion of the population. Mean frequency of consumption of vegetables was highest in Sweden, Finland, Latvia and Lithuania; for potatoes it was highest in the Baltic countries, Iceland and Finland, including Åland. The proportion of low consumers that consumed vegetables less than once a week was under 10% in each country. Within the vegetable group, onion, cucumber, tomato and carrot were among the most popular choices in all countries. Fruit consumption was slightly higher in the Nordic countries compared to the Baltic countries. Within the fruit group, apple, citrus fruits and banana were the three most popular choices in both the Nordic and the Baltic countries. A large variety of berries were consumed in the Baltic countries, in Sweden, and in Finland including Åland. Fish was eaten most often in Norway and Iceland and was least commonly consumed in Denmark and in the Baltic countries. There was large variation in bread consumption across countries. Bread was eaten most frequently in the Baltic countries, in Finland and in Norway, and was consumed least commonly in Iceland. In most of the countries bread high in fibre (> 6g/100g) was the most popular type of bread. In Iceland breads with a semi-high fibre content (3-6 g/100g) were the most commonly consumed and in Lithuania breads with low fibre content (< 3g/100g).

When the results were compared to dietary guidelines, it was found that less than 15% of respondents consumed vegetables and fruit five times a day or more (in total). Of the respondents, 25-65% consumed fish twice a week or more; frequent consumption was most common in Norway and Iceland and least common in Denmark and the Baltic countries. When high consumption of bread was defined

relative to energy needs (5 slices or more a day for women and 7 slices or more for men), the proportion of high bread consumers varied between 5% and 45%, being highest in Latvia, Finland and Estonia and lowest in Iceland and Denmark.

Women consumed more vegetables and fruit than men in most of the countries. Only in Latvia and Lithuania no difference was found between the sexes in this respect. The total consumption of bread was higher among men, but when the proportion of high consumers of bread was defined separately for men and women according to their different energy needs, total bread consumption did not differ between sexes in seven of the eight countries. The exception was Finland, where there were more women than men among high consumers of bread, when defined according to energy needs. The proportion of daily consumers of bread high in fibre did not differ between sexes. Neither did the consumption of fish differ by sex.

Validation studies were carried out in Finland and in Lithuania. Reference methods were 2 x 3-day food records in Finland ($n=73$) and 4 x 24-hr recall in Lithuania ($n=99$). The FFQ consumption data for vegetables and bread agreed well with the reference method data in both validation studies. The Spearman correlation coefficient (FFQ vs. the reference method) was 0.51 for vegetables in Finland and 0.55 in Lithuania when portions under 40 g were excluded from the data derived by the reference method, and 0.54 for bread in Finland and 0.51 in Lithuania. Correlation for fruit consumption data was also good in Finland (0.53 for the global question and 0.65 for the total consumption of differently prepared forms) but weaker in Lithuania (0.31 for the global question and 0.39 for the total consumption of differently prepared forms). For potatoes and fish the correlations were weak. The global questions of the FFQ showed significantly lower intake for vegetables and fruit and significantly higher consumption for bread compared to the reference methods in both countries. In the Finnish validation study the total consumption of differently prepared vegetables per FFQ corresponded better with the reference method ($p>0.05$) than did responses to the global question on vegetable consumption. The same was true for the Lithuanian study when portions under 40 g were excluded from the data derived by the reference method. The reproducibility of the FFQ was shown to be good when it was repeated in Lithuania and Finland after 6-8 months. (The Spearman correlation coefficient was 0.49-0.75, depending on the food group, in the Finnish study, and 0.51-0.83 in the Lithuanian study.)

This study has provided a validated tool for monitoring the consumption frequency of the proposed health indicator foods. This tool, the NORBAGREEN FFQ, was shown to be useful especially for measuring vegetable and fruit consumption. Monitoring potato consumption separately, but in conjunction with the monitoring of vegetable consumption, is suggested for a better understanding of the total consumption pattern for plant foods.

In the future the NORBAGREEN FFQ can continue to be used to follow trends in vegetable, potato, fruit, bread and fish consumption in the Nordic and Baltic countries. The validation study carried out as part of this project suggests that the questions aimed at measuring potato and fish consumption need to be developed further to increase the validity of these data. A follow-up study approximately every 3-5 years would serve to monitor trends in these countries. It is proposed, however,

that the FFQ be simplified, to make repeat studies more feasible. The experience of this survey indicates that the same method could be applied in other countries as well, but would first need to be tested and validated in such countries.

Tiivistelmä

Kasvien, hedelmien ja marjojen, kalan sekä leivän kulutusta on ehdotettu Euroopan Unionissa seurattavaksi ruokavalion terveysindikaattoreina. Aidosti vertailukelpoisten kulutustietojen puute on kansainvälisesti tunnettu ongelma. NORBAGREEN-projektin tavoitteena oli tutkia näiden elintarvikkeiden sekä perunan kulutusta vertailukelpoisella menetelmällä kaikissa Pohjoismaissa ja Baltian maissa. Projektin yhteydessä tuotettiin ja validoitiin frekvenssikyselylomake (FFQ) tätä tarkoitusta varten. Kyselylomake muokattiin ja laajennettiin aikaisemmin toteutetun NORDGRÖNT-projektin (1996-1998) yhteydessä validoidusta lomakkeesta. Kyselylomake sisälsi yhden kokonaiskulutusta selvittävän kysymyksen elintarvikeryhmää kohti ja moniosaiset kysymykset eri menetelmin valmistettujen kasvien, hedelmien ja marjojen kulutustiheydestä. Lisäksi kysyttiin yleisimpien yksittäisten kasvien, hedelmien ja marjojen, pääruokana sekä lisäksi syödyn kalan sekä kuitupitoisuudeltaan erilaisten leipien kulutusfrekvenssejä. Haastattelumenetelmänä käytettiin Pohjoismaissa tietokoneavusteista puhelinhaastattelua (Computer Assisted Telephone Interview, CATI) sekä Baltian maissa henkilökohtaista lomakkeelle tallennettavaa haastattelua (Paper Assisted Personal Interview, PAPI). Haastattelujen koordinoinnista tutkimusmaissa vastasi Taloustutkimus Oy Suomesta. Hyväksyttävästi loppuunsaatettujen haastattelujen määrä oli yhteensä 8397 (n. 1000 haastattelua/maa, 250 haastattelua/Ahvenanmaa, ikäryhmässä 15-74 -vuotiaat). Otokset olivat maakohtaisesti edustavia sukupuolen, ikäryhmän ja alueen suhteen. Tutkimuksessa havaittiin, että eri maiden tulosten vertailukelpoisuuden varmistaminen vaatii erityistä huolellisuutta ja tiivistä yhteistyötä koko tutkimusprosessin ajan.

Tutkimuksessa havaittiin, että keskimääräiset tutkittujen elintarvikkeiden käyttöfrekvenssit olivat suurimmat samoissa maissa, joissa muihin maihin verrattuna suurin osa väestöstä oli elintarvikkeen säännöllisiä käyttäjiä. Keskimääräinen kasvien käyttöfrekvenssi oli suurin Ruotsissa, Suomessa, Latviassa sekä Liettuassa. Perunan käyttö oli yleisintä Baltian maissa, Islannista sekä Suomessa, Ahvenanmaa mukaan lukien. Tutkimukseen osallistuneissa maissa kuluttajista vain alle 10% kulutti kasviksia harvemmin kuin kerran viikossa. Yksittäisistä kasviksista sipuli, kurkku, tomaatti ja porkkana olivat suosituimpia. Hedelmiä käytettiin Pohjoismaissa jonkin verran useammin kuin Baltian maissa. Eri hedelmistä omena, sitruhedelmät ja banaani olivat yleisimmin käytetyt hedelmät kaikissa tutkimukseen osallistuneissa maissa. Useita eri marjoja kulutettiin Baltian maissa, Ruotsissa sekä Suomessa Ahvenanmaa mukaan lukien. Kalan kulutus oli yleisintä Norjassa ja Islannista. Harvimminkin kalaa käytettiin Tanskassa ja Baltian maissa. Leivän kulutuksessa oli suuria eroja eri maiden välillä. Leipää syötiin eniten Baltian maissa, Suomessa ja Norjassa ja vähiten Islannissa. Yleisin leipätyyppi oli runsaasti kuitua sisältävä leipä (kuitua >6g/100 g tuotetta). Islannissa sekaleipä oli yleisin (kuitua 3-6 g/100g) ja Liettuassa vaalea leipä (kuitua <3g/100g).

Kun tuloksia verrattiin kansainvälisesti yleisiin ruokavaliosuosituksiin todettiin, että alle 15% vastaajista kulutti vihanneksia ja hedelmiä vähintään 5 annosta päivässä. Vastaajista 25-65% söi kalaa kaksi kertaa viikossa tai enemmän. Suositusten mukainen kalan käyttö oli yleisintä Norjassa ja Islannissa ja harvinaisinta

Tanskassa ja Baltian maissa. Kun runsas leivän käyttö suhteutettiin naisten ja miesten erilaiseen energiatarpeeseen (runsas käyttö naisilla >5palaa/pv, miehillä vastaavasti >7 palaa/pv), runsaasti leipää käyttävien osuus vaihteli 5-45% välillä. Runsaasti leipää käyttävien osuus oli suurin Latviassa, Suomessa ja Virossa ja pienin Islannissa ja Tanskassa.

Naiset kuluttivat enemmän kasviksia ja hedelmiä kuin miehet useimmissa maissa. Latviassa ja Liettuassa ei näiden elintarvikkeiden käyttötiheydessä havaittu sukupuolieroja. Leivän kokonaiskulutus oli suurempaa miehillä kuin naisilla. Kuitenkin edellä määritellyn runsaasti leipää kuluttavien väestöryhmän osuus ei eronnut miesten ja naisten välillä muualla kuin Suomessa, jossa runsaasti leipää syövien naisten osuus oli suurempi kuin miesten osuus. Runsaskuituisen leivän päivittäiskäyttäjien osuudet eivät eronneet sukupuolittain.

Tutkimuksen yhteydessä toteutettiin kaksi validointitutkimusta, toinen Suomessa, toinen Liettuassa. Vertailumenetelmänä käytettiin 2 x 3-päivän ruokapäiväkirjaa Suomessa (n=73) ja 4 x 24h-ruoankäyttöhaastattelua Liettuassa (n=99). Frekvenssilomakkeella mitattu kulutus järjesti vastaajat kasvien ja leivän osalta hyvin samanlaiseen järjestykseen kuin vertailumenetelmät molemmissa maissa. Spearmanin järjestyskorrelaatiokerroin oli vihannesten kulutukselle 0,51 Suomessa ja 0,55 Liettuassa, kun pienet vihannesannokset (alle 40g) vertailumenetelmän tuloksista jätettiin huomiotta. Leivän kulutuksen korrelaatio oli 0,54 Suomessa ja 0,51 Liettuassa. Frekvenssilomakkeen ja vertailumenetelmän hedelmien kulutustulosten välinen korrelaatio oli Suomessa hyvä (0,53 kokonaiskulutusta mittaavalle kysymykselle ja 0,65 eri menetelmin valmistettujen hedelmä- ja marjaruokien summakulutukselle) mutta Liettuassa toteutetussa tutkimuksessa jonkin verran heikompi (0,31 kokonaiskulutuskysymykselle ja 0,39 eri menetelmin valmistettujen hedelmä- ja marjaruokien summakulutukselle). Perunan ja kalan kulutuksen osalta korrelaatiot olivat heikot. Frekvenssikyselyn kokonaiskulutusta mittaavat kysymykset aliarvioivat vihannesten ja hedelmien kulutusta kun taas leipäkysymykset yliarvioivat kulutusta verrattuna vertailumenetelmällä kerättyyn tietoon molemmissa maissa. Suomen validointitutkimuksessa todettiin, että eri tavoin valmistettujen vihannesten summakulutus vastasi paremmin vertailumenetelmällä mitattua kulutusta (>0.05) kuin kokonaiskulutusta mittaava frekvenssikysely. Sama havaittiin Liettuan tutkimuksessa silloin kun vertailumenetelmän pienet vihannesannokset jätettiin ottamatta huomioon. Kyselyn toistettavuus 6-8 kuukauden päästä todettiin molemmissa maissa hyväksi (Spearmanin korrelaatiokerroin Suomen tutkimuksessa eri ruoille ole 0.49-0.75 ja Liettuan tutkimuksessa 0.51-0.83).

Tämä tutkimus tuotti validoidun tutkimusmenetelmän ruokavalion terveysindikaattoreiksi nimettyjen elintarvikkeiden, erityisesti kasvien ja hedelmien sekä marjojen kulutuksen seuranta varten. Perunan kulutuksen seuranta suositellaan toteutettavaksi vihannesten kulutuksen seurannan rinnalla, jotta kasvien kokonaiskulutuksen rakenne voitaisiin ymmärtää paremmin.

NORBAGREEN-tutkimuksessa tuotettua ja validoitua frekvenssikyselylomaketta voidaan käyttää vihannesten, perunan, hedelmien, leivän kalan kulutuksen seurantaan Pohjoismaissa ja Baltian maissa. Tässä yhteydessä toteutetut validointitutkimukset osoittivat kuitenkin, että perunan ja kalan kulutusta kartoittavat kysymykset vaativat

muokkausta validiteetin parantamiseksi. Noin 3-5 vuoden välein toteutettava seuranta tutkimus mahdollistaisi kulutustrendien seurannan. Frekvenssilomaketta ehdotetaan kuitenkin yksinkertaistettavaksi tutkimuksen toteuttamisen helpottamiseksi. Tässä tutkimuksessa saadut kokemukset viittaavat siihen, että samaa menetelmää voidaan soveltaa myös muissa maissa, mutta menetelmä tulisi ensin sopeuttaa maan elintarvikevalikoimaan ja validoida.

Sammanfattning

Grönsaker, frukt, bröd och fisk har föreslagits som indikatorlivsmedel för en hälsosam kost. Bristen på konsumtionsdata för livsmedel som är helt jämförbara mellan länder är ett erkänt internationellt problem. Syftet med NORBAGREEN studien var att undersöka konsumtionen av dessa livsmedel och potatis med en jämförbar metod i de nordiska och baltiska länderna samt att ta fram och validera ett livsmedelsfrekvensformulär (FFQ) för detta ändamål. Formuläret modifierades och utökades med utgångspunkt från ett liknande validerat formulär från NORDGRÖNTprojektet (1996-1998). Formuläret innehåller en fråga om totalkonsumtionen av varje livsmedelsgrupp och flera frågor om konsumtionen av olika tillagningsformer av grönsaker, potatis och frukt. Vidare ingår frågor om enskilda grönsaker och frukter, konsumtionen av fisk som huvudrätt och pålägg m.m., samt konsumtionen av brödsorter med olika innehåll av kostfibrer.

Datorstödda telefonintervjuer (Computer Assisted Telephone Interviews (CATI)) användes i de nordiska länderna och formulärbaserade personliga intervjuer (Paper Assisted Personal Interviews (PAPI)) i de baltiska länderna. Intervjuerna koordinerades av TOY Research (Finland). Antalet genomförda intervjuer var 8397 (ca. 1000 personer per land, 250 på Åland, 15-74 år). Urvalet var representativt med avseende på kön, ålder och region. Erfarenheterna visar att det var nödvändigt med en noggrann och kontinuerlig kontroll av faktorer som påverkar jämförbarheten i en internationell studie av denna karaktär.

De högsta genomsnittliga konsumtionsfrekvenserna för de studerade livsmedlen återfanns i samma länder där dessa livsmedel konsumerades regelbundet av en stor andel av befolkningen. Genomsnittskonsumtionen av grönsaker var högst i Sverige, Finland, Lettland och Litauen, och för potatis i de baltiska länderna, Island och Finland inklusive Åland. Andelen lågkonsumenter av grönsaker (< 1 g/ng i veckan) var mindre än 10 % i alla länder. Lök, gurka, tomat och morot hörde till de mest frekvent konsumerade grönsakerna i alla länder. Konsumtionsfrekvenserna för frukt var något högre i de nordiska än i de baltiska länderna. Äpple, citrusfrukter och banan hörde till de mest frekvent konsumerade frukterna i alla länder. Ett flertal olika bär konsumerades i de baltiska länderna, Sverige och Finland inklusive Åland. Fisk åts oftast i Norge och Island och mest sällan i Danmark och i de baltiska länderna. Variationen i brödkonsumtionen var stor mellan länderna. Brödkonsumtionen var högst i de baltiska länderna, Finland och Norge medan den var lägst i Island. I de flesta länderna var bröd med hög fiberhalt (> 6g/100g) den mest populära brödtypen. I Island konsumerades mest bröd med medelhög fiberhalt (3-6 g/100g) och i Litauen bröd med låg fiberhalt (< 3 g/100g).

Mindre än 15 % av respondenterna åt grönsaker och frukt sammanlagt fem gånger per dag eller oftare, vilket är en vanlig rekommendation. 25-65 % åt fisk två gånger i veckan eller oftare, och andelen var högst i Norge och Island och lägst i Danmark och de baltiska länderna. När brödkonsumtionen relaterades till energibehov (≥ 5 skivor per dag för kvinnor och ≥ 7 skivor per dag för män), var andelen storkonsumenter 5-45 %, högst i Lettland, Finland och Estland och lägst i Island och Danmark.

Kvinnor åt oftare grönsaker och frukt än vad män gjorde i de flesta länder med undantag av Lettland och Litauen. Den totala brödkonsumtionen var högre bland män än bland kvinnor, medan andelen storkonsumenter, definierade enligt ovan, inte skilde sig mellan könen i 7 av 8 länder. I Finland, var andelen storkonsumenter bland kvinnor större än bland män. Andelen som åt bröd med högt fiberinnehåll dagligen skilde sig inte mellan könen. Några könsskillnader i konsumtionen av fisk påvisades inte heller.

Validringstudier genomfördes i Finland och Litauen. Som referensmetoder användes i Finland 2 x 3-dagars kostregistrering (n=73) och i Litauen 4 x 24-h intervju (n=99). FFQ rankade konsumtionen av grönsaker och bröd väl jämfört med referensmetoden i båda studierna. Korrelationen (Spearman) var 0,51 för grönsaker i Finland och 0,55 i Litauen när portioner under 40 g uteslöts från data erhållna från referensmetoden, och 0,54 för bröd i Finland och 0,51 i Litauen. Korrelationen för fruktkonsumtionen (FFQ vs. referensmetoden) var också god i Finland (0,53 för totalkonsumtionen och 0,65 för summan av konsumtionsfrekvenserna för olika tillagningsformer), men svagare i Litauen (0,31 för den totala konsumtionen och 0,39 för summan av tillagningsformer). Korrelationerna för potatis och fisk var svaga. Frågorna om totalkonsumtionen av grönsaker och frukt gav signifikant lägre och signifikant högre konsumtionsfrekvenser jämfört med referensmetoden i båda länderna. I den finska studien var överensstämmelsen för summan av konsumtionsfrekvenserna för de olika tillagningsformerna med referensmetoden bättre ($p > 0.05$) än frågan om den totala konsumtionen. Det samma gällde för den litauiska studien när portioner under 40 g uteslöts från data erhållna från referensmetoden. Reproducerbarheten av formuläret var god, när det besvarades av respondenterna efter en period av 6-8 månader. (Spearman's korrelationskoefficient för de olika livsmedelsgrupperna var 0,49-0,75 i den finska och 0,51-0,83 i den litauiska studien.)

Denna undersökning har genererat ett validerat frågeformulär för att följa konsumtionsfrekvenser i befolkningen för föreslagna indikatorlivsmedel för en hälsosam kost. Resultaten visar att formuläret är användbart, speciellt för att mäta konsumtionen av grönsaker och frukt. En separat fråga om potatiskonsumtionen föreslås ingå tillsammans med grönsakskonsumtionen för att bättre tolka den totala konsumtionsmönstret för vegetabla livsmedel.

I framtiden kan NORBAGREEN formuläret användas för att följa trender i konsumtionen av grönsaker, potatis, frukt, fisk och bröd i de nordiska och baltiska länderna. Valideringsstudierna genomförda inom projektet indikerar att frågorna om konsumtionen av potatis och fisk bör vidareutvecklas för att öka deras validitet. En upprepning av studien var 3-5 år ger möjlighet till att följa trender i dessa länder. Erfarenheterna av studiens genomförande visar att man bör överväga en förenklad version av formuläret, vilket kan underlätta fältarbetet och minska kostnaderna. Erfarenheterna visar vidare att samma metod bör kunna användas i andra länder, men att formuläret då kräver en lämplig anpassning och validering.

1 Introduction

1.1 Vegetables, fruit, fish and bread as health indicator foods

Increased consumption of fruit and vegetables is a widely accepted goal in public health work. A large body of epidemiological evidence supports the hypothesis that vegetables and fruit are protective in the aetiology of chronic diseases such as cancer, in particular lung, gastrointestinal and hormone-related cancers (World Cancer Research Fund, 1997; Feskanich *et al.*, 2000; van't Veer *et al.*, 2000; Voorrips *et al.*, 2000), coronary heart disease (CHD) and stroke (Ness & Powles, 1997; Klerk *et al.*, 1998), and diabetes (Williams *et al.*, 1999). A positive link between vegetable and fruit consumption and bone health has also been suggested (New *et al.*, 2000). The protective role of fruit and vegetables against other diseases has also been studied with promising results, but the evidence is still insufficient. It has been estimated that in the Netherlands a 6-28% reduction in cancer incidence and a 6-22% reduction in cardiovascular deaths could be achieved by increasing the average intake of vegetables and fruit from the current 250 g/day to the recommended 400 g/day among the general Dutch population (van't Veer *et al.*, 2000). Smoking status has been suggested to be an important factor determining the potential benefits associated with fruit and vegetable consumption. Data from the 25-year follow-up of men in three European countries Finland, Italy and the Netherlands showed that fruit intake was associated with reduced risk of lung cancer, but the beneficial effect was limited to heavy smokers (Jansen *et al.*, 2001).

A whole variety of mechanisms have been postulated for the potential disease-preventive effects of vegetables and fruit. Antioxidant activity, modulation of detoxifying enzymes, stimulation of the immune system, decrease in platelet aggregation, alteration in cholesterol metabolism, modulation of steroid hormone metabolism, blood pressure reduction and even antibacterial and antiviral activity have been hypothesised as mechanisms (Lampe, 1999). Vegetables and fruit are known to have a high content of vitamins (e.g. folates and vitamin C), minerals (e.g.

potassium and magnesium) and fibre, but also a wide variety of other phytochemicals (carotenoids, flavonoids, phytosterols, isothiocyanates, etc.) relative to their energy content. The nutrient density of these foods is therefore very high. In addition to their straight contribution to nutrient intake, they may exert their effect by replacing other, less favourable foods in the dietary pattern. It has been shown in several countries that a diet high in vegetables and fruit contains less fat or saturated fatty acids and more fibre than a diet that is low in vegetables and fruit (Becker, 1999; Moschandreas & Kafatos, 1999; Valsta, 1999). These foods may also serve as indicators of other healthy food choices, and a healthier lifestyle generally.

The potential protective effect of cereals against chronic diseases has been mainly connected with the consumption of whole-grain cereals. This area has received intensive study for over 20 years. Several observational studies support the beneficial role of whole-grain intake in reducing the risk of CHD. High whole-grain consumption is also associated with a reduced risk of developing diabetes (Salmerón *et al.*, 1997a; Salmerón *et al.*, 1997b), hypertension (Ascherio *et al.*, 1992), and some types of cancer (Adlercreutz & Mazur, 1997). The beneficial effects of whole-grain foods include: lowering of serum total and LDL-cholesterol, in some cases also hypotriglyceridemic effects (Anderson, 1995), antioxidant properties and possibly also antithrombotic and decreased platelet-aggregating effects (Marckmann *et al.*, 1993). In addition, the effects of whole-grain foods on insulin resistance and the beneficial insulinemic response to whole-grain foods are of great potential importance for reducing the risk of CHD and type 2 diabetes (Salmerón *et al.*, 1997a; Salmerón *et al.*, 1997b; Liu *et al.*, 1999). Whole-grain foods provide complex carbohydrates, resistant starch, dietary fibre, minerals (e.g. copper, zinc and manganese), vitamins (e.g. vitamin E) and phytochemicals (e.g. phenolic acids, lignans and phytosterols) (Slavin, 2000). Bread consumption is considered an indicator of the proportion of carbohydrate in the diet (Steingrimsdóttir *et al.*, 2002).

The evidence for beneficial effects of fish consumption on health started to emerge more than 20 years ago and has been extensively reviewed (Sheard, 1998; Segal-Isaacson & Wylie-Rosett, 1999; Nestel, 2000; Schmidt *et al.*, 2000; Severus *et al.*, 2001; Steingrimsdóttir, 2001; Jones & Lau, 2002; Simopoulos, 2002). The results

regarding the source of the protective effect of dietary fish and fish oil have been conflicting, however (Sheard, 1998). The main nutritional feature of fish is its high omega-3 fatty acid content, but it is also a rich source of certain vitamins (e.g. vitamin D) and minerals (e.g. iodine and selenium) important for health.

Today, the evidence strongly indicates that eating fish or n-3 fatty acids from fish reduces the risk of fatal coronary heart disease (CHD). In observational studies it has been shown that in the general population, the consumption of moderate amounts of fish or n-3 fatty acids from fish is associated with a lower risk of fatal CHD, in particular sudden cardiac death (Albert *et al.*, 1998; Yuan *et al.*, 2001; Bucher *et al.*, 2002; Erkkilä *et al.*, 2003). Three secondary prevention trials have shown that prescription of fish or long chain n-3 fatty acids to patients with prior myocardial infarction is effective in preventing mortality due to CHD (Burr *et al.*, 1989; Singh *et al.*, 1997; Anonymous, 1999). The long chain n-3 fatty acids may modify the key risk factors for cardiovascular disease in several ways: by increasing HDL2 cholesterol and reducing triacylglycerol-rich lipoprotein concentrations, thus reducing postprandial lipemia, and by reducing remnant concentrations, improving endothelial function and better arterial elasticity. It is not clear, however, whether the protection against cardiovascular diseases is directly related to antiatherogenic functions of these fatty acids or is mediated through their modification of certain risk factors through mechanisms not directly related to lipids (Nestel, 2000). The most popular hypothesis today is that n-3 fatty acids reduce the risk of CHD mortality via anti-arrhythmic effects (Albert *et al.*, 1998; Jones & Lau, 2002). Effects of n-3 fatty acids on cardiovascular risk aside, consumption of fish may be beneficial for patients suffering from chronic inflammatory diseases, by decreasing disease activity and the need for anti-inflammatory drugs (Simopoulos, 2002).

Fruit, vegetables, bread and fish have been proposed to be monitored as dietary indicators for health by an EU-supported project, the European Food Consumption Survey Method (EFCOSUM), which has defined a set of dietary components that are relevant determinants of health in Europe. These dietary components are intended to serve as nutrition indicators in the European Health Monitoring Programme; as such, they should be limited in number, relevant to health and practical for all countries

involved with respect to data gathering and comparability of data. The EFCOSUM project group has suggested the following complete list of diet indicators to be monitored in Europe, in order of priority: vegetables, fruit, bread, fish, and saturated fatty acids, as well as total fat (percentage energy, %E) and ethanol (g/day) (Steingrimsdóttir *et al.*, 2002). Other indicators, i.e. folate, iodine, iron, sodium and vitamin D have been suggested to be monitored as biomarkers (Ovesen & Boeing, 2002).

The findings of the EFCOSUM project (Brussaard *et al.*, 2002) emphasised the need for co-ordinated nutritional surveillance activities within the European Union. Available national data on dietary intake were noticed not to be directly comparable; the diversity of approaches taken in the past to assessing dietary intake on an individual level is huge. Household budget surveys of 13 European countries (DAFNE project) have provided data at the food availability level, but there are still large lacunae in consumption data at the individual level. Therefore a new, unified attempt at data collection at the individual level has been suggested (Brussaard *et al.*, 2002). Alternatively, improving the comparability of dietary intake assessments using currently available national food consumption surveys might also be a way to address the acute need for dietary and health monitoring in Europe, but would still require resources for the modification of these data (Verger *et al.*, 2002).

The NORDGRÖNT working group evaluated the possibility of achieving comparable and regular data at an individual level on the intake of vegetables, potatoes, fruit and berries among the populations of the Nordic countries. The working group concluded that existing per capita statistics, household consumption surveys and dietary surveys were not good enough for this purpose. However, in spite of their weaknesses existing data sufficed to show that the consumption of vegetables and fruit is well below recommended levels. The working group suggested the development and testing of a new, simple method that can provide comparable data on consumption frequencies for potatoes, vegetables, fruit and berries in the Nordic countries, in order to permit comparison with the goals expressed in national health policies. (Johansson *et al.*, 1999a).

Consumption data are available for vegetables both in the Nordic and in the Baltic countries, but these lack comparability (across countries) because of methodological differences, samples not having been of the same kind, etc. The first attempt to collect comparable food consumption frequency data as part of a collaborative venture for monitoring health-related behaviour, practices and lifestyles in Finland and the Baltic countries has been the FINBALT Health Monitoring Survey carried out since 1998. This monitoring project started first as a collaboration between Finland and Estonia in 1990; it then expanded to include Lithuania in 1994 and covered all of the Baltic countries when Latvia was included in the study in 1998. This project has been using a postal questionnaire as the data collection method (Prättälä *et al.*, 1999; Prättälä *et al.*, in press). The FINBALT survey only contains data on the frequency of consumption of vegetables, fruits and fish by participants during the week preceding questionnaire completion, and is therefore not representative of year-round consumption. For instance, the Baltic countries show very high consumption of locally grown fruits, vegetables and potatoes, leading to considerable seasonal variations (Pomerleau *et al.*, 2000).

1.2 Consumption of vegetables, potatoes, fruit, fish and bread in the Nordic and Baltic countries

1.2.1 Consumption and availability data sources

The consumption of foods can be described in four different formats: Food Balance Sheets (FBS), household consumption surveys, national dietary surveys, and surveys measuring selected aspects of the diet, such as health behaviour surveys and market surveys.

All eight countries report per capita availability of foods; these data are published yearly by the Food and Agriculture Organisation (FAO) as FBS. The FAO uses relatively standardised methods for compiling FBS. However, significant unsystematic differences, regarding both foods and nutrients, exist between national and FAO FBS (Becker, 1988; Becker & Helsing, 1991).

An evaluation of the comparability of national per capita food availability data in the Nordic countries showed that the basic data sources and calculation methods were relatively similar for several major food groups, for example cereals. However, for food groups such as fish, potatoes, vegetables and fruit, differences in data sources, conversion factors, commodity coverage, etc. resulted in less comparable data (Becker, 1992). Per capita food availability in the Nordic countries between 1965 and 1998 was also compiled and published in a report, and again it was pointed out that the data regarding fish, potatoes, vegetables and fruits are uncertain (Becker *et al.*, 2001). Since 1990 per capita food availability data from the Nordic countries have been published in the Nordic Statistical Yearbook. For the Baltic countries, FBS for 1995-2001 are available on the FAO web site. For several of the food groups the per capita availability differs considerably between 1995 and 2001. FAO data deviate from national per capita data (Tables 1 and 2).

Table 1. Food availability, kg per capita per year, 2001. FAO Food Balance Sheets.

	DEN	EST	FIN	ICE	LAT	LIT	NOR	SWE
Vegetables	100	76	70	54	86	95	63	74
Potatoes	82	132	71	51	100	131	71	53
Fruit	96	78	94	108	59	70	110	102
Cereals	127	138	113	89	113	168	128	103
Fish	27	22	32	90	-20	20	51	31

Table 2. Food availability, kg per capita per year, in the Nordic countries, 2001. Nordic Statistical Yearbook 2002.

	DEN	FIN	ICE	NOR	SWE
Vegetables	-	63	49	59	65
Potatoes	57	62	64	76	84
Fruit	-	91	67	77	95
Cereals*	77	65	-	71	71
Fish	-	26	47	37	28

* wheat, rye, oats, barley and corn

Household budget surveys are performed regularly or sporadically in all eight countries. One or repeated national dietary surveys are also performed in all eight countries. However, methodological differences complicate comparisons between countries. This problem applies both to household budget surveys and to national dietary surveys. Most of the market surveys performed in the eight countries during the last decades have also used different methodologies. However, health behaviour surveys using the same methodology have been performed in co-ordinated fashion in Finland and the Baltic countries several times over the last ten years (Finbalt Health Monitor, 1999; Puska *et al.*, 2003). Repeated national market surveys using the same methods have also been carried out (Scanfact, 1999; MMI, 2000).

In the following overview, FBS, repeated household budget surveys and national dietary surveys are used to describe trends; the national dietary surveys are used to show differences within the national populations.

1.2.2 Trends in consumption

Over the last 25 years the per capita availability of vegetables and fruit has increased in the Nordic countries (Becker *et al.*, 2001). In the 1970s the availability of vegetables and fruit was lowest in Iceland and Finland. The increase in availability over the last decades has been much larger in Finland than in the other Nordic countries, so that today availability is at a similar level in Finland, Sweden and Norway, though still lower in Iceland. Per capita availability data have not been published in Denmark since the 1980s. The FAO publishes food balance sheet data for Denmark but draws on a number of data sources (e.g. production and trade statistics) and methods for compiling them. As a result the Danish data are not transparent.

The national dietary surveys in Denmark in 1995 and 2000-2001 (Fagt *et al.*, 2002), in Iceland in 1990 and 2002 (Steingrímisdóttir *et al.*, 1991; Icelandic Nutrition Council), in Sweden in 1989 and 1997-98 (Becker & Pearson, 2002) and in Finland in 1997 and 2002 (FINDIET 1997 Study group, 1998; Männistö *et al.*, 2003) confirm

this trend: the most marked change over time has been an increase in the consumption of vegetables and fruits.

The per capita data from the Baltic countries do not permit any long-term trend comparisons. According to per capita availability data the availability of vegetables, fruits and berries increased in Lithuania during the last ten years (Statistical Yearbook of Lithuania, 2001; Statistical Yearbook of Lithuania, 2002). Lithuanian health behaviour surveys (Grabauskas *et al.*, 1998; Grabauskas *et al.*, 2001) also show increased consumption of fruit and vegetables. Latvian household budget surveys (Statistical Yearbook of Latvia, 2001) show increased consumption of fruit and berries and decreased consumption of vegetables during the years 1996-2000. Estonian health behaviour surveys performed in 1990-2000 (Public Health Institute, 2002) show growth in the consumption frequency of both vegetables and fruit. At the same time, Estonian household budget surveys covering 1996-2000 (Estonian Nutrition Society, 2002) indicate a decreased consumption of vegetables and small changes for fruit. In 2000 the per capita availability of vegetables was at a similar or higher level, but the consumption of fruits was lower, in the Baltic compared to the Nordic countries.

The total consumption of potatoes in Nordic countries has been stable or decreasing (in Finland), but according to data from Norway, Iceland and Sweden the consumption of potato products such as French fries, chips, etc. has much increased. The consumption of potatoes has decreased in all Baltic countries. Nevertheless, in 2000 per capita availability of potatoes was much higher in the Baltic compared to the Nordic countries.

The availability of cereals in Nordic countries has increased in the last 20 years, except in Finland, where it has been fairly stable. In Denmark the consumption of bread seemed to decrease between 1995 and 2000; in Iceland the consumption of bread increased between 1990 and 2002. In Lithuania per capita availability of cereals increased from 1990 to 1997. Since 1998 it has been decreasing. By contrast, in household budget surveys of Latvia and Estonia consumption of cereals decreased.

Despite these relative declines, in 2000 the per capita availability of cereals was higher in the Baltic compared to the Nordic countries.

The per capita availability of fish has slightly increased in Finland and Sweden, and decreased in Iceland. Figures for per capita availability of fish have not been published by Denmark since 1977 and by Norway the last ten years. Availability of fish has decreased in all Baltic countries, and in 2000 was lower than in the Nordic countries.

1.2.3 Differences in consumption within populations

Intakes of food groups according to national dietary surveys using different dietary survey methods are shown in Table 3. Men seems to consume potatoes, bread and fish more than women and women more fruits and berries in the all countries. In the Nordic countries women consumed vegetables more than men. (Table 3.) A common finding in the national dietary surveys carried out in all the Nordic countries was that men had a higher intake of most food groups compared to women; however, women had a higher intake of vegetables, fruit and berries (Johansson & Solvoll, 1999). Furthermore, the intake of most food groups decreased with age; however, the intake of potatoes, vegetables and fish was higher in the older than the younger age groups. Similar differences were found in surveys in the Baltic countries. However, in the Estonian national dietary survey men had a higher consumption of vegetables than women (Pomerleau *et al.*, 2001). Estonian health behaviour surveys performed in 1990-2000 (Public Health Institute, 2002) observed higher growth in consumption of vegetables of women. In the Latvian Nutrition and Lifestyle survey of 1997 the intake of fish was higher in the younger than the older age groups, and daily consumption of vegetables was lower in men than in women and lower in respondents aged 50 and above than in younger respondents (Pomerleau *et al.*, 2001). In the Lithuanian national dietary survey men had higher intake of vegetables and lower intake of fruits than women (Pomerleau *et al.*, 2001). Among women intake of vegetables decreased with age. Daily consumption of vegetables was higher among older men compared to younger.

Table 3. Consumption of food groups according to national dietary surveys using different dietary survey methods, grams per day, mean, for men (M) and women (W).

	Sex	DEN	EST	FIN	ICE	LAT	LIT	NOR	SWE
Method ¹		7 DR	24-hr	48-hr	24-hr	24-hr	24-hr	QFFQ	7 DR
Year		2000-1	1997	2002	2002	1997	1997	1997	1997-8
Response		56 %	67 %	63 %	71 %	77 %	73 %	54 %	60 %
Age		15-75	19-64	25-64	15-80	19-65	19-65	16-79	18-74
N		869	2018	2007	1242	2308	2181	2672	1215
Vegetables	M	141	220	125	101	201	211	123	96
	W	152	192	142	98	168	168	146	127
Fruit ²	M	212	135	180	121	67	139	218	191
	W	265	168	216	137	96	199	225	236
Potatoes	M	139	231	116	102	275	292	147	168
	W	90	176	76	68	172	191	100	116
Bread ³	M	156	218	166	136	215	181	224	116
	W	123	160	113	102	148	115	154	85
Fish	M	19	24	34	51	33	21	72	34
	W	16	22	22	31	21	16	58	35

1) DR=dietary records; 24-hr = 24-hour recall; QFFQ = quantitative food frequency questionnaire.

2) Includes berries and juices, not jam, except in the Danish data, where jam is included.

3) Only bread, not other cereals, except in the Baltic data, where all cereals are included.

Finland: Männistö et al, 2003

Sweden: Becker and Pearson, 2002

Norway: Johansson and Solvoll, 1999

Denmark: Fagt et al, 2002

Icelandic: Icelandic Nutrition Council, 2003

Baltic countries: Pomerleau et al, 2001

Food intake is also associated with social status and lifestyle. In the Norwegian survey men and women with more education had a higher intake of vegetables, fruits, berries and fish and a lower intake of potatoes than those with less education. In the Swedish survey more education was associated with higher intake of vegetables and fruit among men and lower intake of potatoes among both men and women. Persons with more education had a higher consumption of fresh vegetables and fruits in the Lithuanian and Estonian health behaviour surveys. In the Danish survey in 1995 there were significant differences in consumption of vegetables and

fruit among educational groups, higher educated subjects consumed vegetables and fruit more than low educated subjects. An evaluation of 33 surveys performed during 1985-97 in 15 European countries showed that in the majority of the studies, with the exception of a few in southern and eastern Europe, consumption of vegetables and fruit was more common among those with higher education (Roos *et al.*, 2001).

1.3 Dietary guidelines for vegetables, potatoes, fruit, fish and bread consumption

The quantitative dietary guidelines for vegetables, potatoes, fruit, fish and bread in the Nordic and the Baltic countries are presented in Table 4. In addition to existing quantitative guidelines for the consumption of vegetables, fruit, potatoes, bread (especially whole-grain bread) and fish, consumption of those foods is encouraged in the Nordic and the Baltic countries.

Danish health authorities have since 1998 recommended an intake of 600 g fruit and vegetables per day (including max. 100 g of juice, and excluding potatoes) (Food Agency of Denmark, 1998). Recommendations for fish are presently being evaluated; for now the health authorities recommend an intake of 200-300 g fish a week (Food Agency of Denmark, 2000). No quantitative recommendations are currently given for other food groups.

The Estonian Ministry of Social Affairs and the Estonian Association of Nutrition Science jointly developed food-based dietary guidelines in 1998. According to these, the daily food intake should break down as follows: 25% milk products, 19% vegetables, 16% potatoes, 15% grain products, 11% fruit and berries, 9% meat, fish and eggs, 3% sugar, sweets and other foods, and 2% additional fats. The guidelines give a quantitative recommendation for 3-5 portions of vegetables, 2-4 portions of fruit, and 3-5 portions of potatoes per day. Fish is recommended 2-3 times per week and daily consumption of cereals should be 6-8 portions (Vaask *et al.*, 1998).

The Finnish National Nutrition Recommendations of today were launched in 1998 (National Nutrition Council, 1998). These dietary guidelines encourage eating cereal products, especially whole-grain bread and bread products, plenty of potatoes (about 25% of the plate area), plenty of vegetables and fruit daily, and more fish (at least 2 times/week). It has also been suggested that consumers eat 500 g vegetables and fruit daily, but this is not an official recommendation.

The Icelandic Nutrition Council, the Icelandic Heart Association and the Icelandic Cancer Society started a campaign to increase fruit and vegetable consumption under the slogan “Five a Day” in 1995. Their quantitative recommendation is for 5 portions or 500 g of fruit, vegetables and potatoes per day. According to the Icelandic Nutrition Goals the consumption of whole grain and fish is encouraged.

Latvian health authorities advocate an increased intake of whole-grain cereals, fish, potatoes, vegetables and fruit. For fruit, berries and vegetables (without potatoes) their quantitative recommendation is to eat at least 400 grams per day. For grain cereals (especially whole-grain bread), cereal products and potatoes the recommendation is to eat about 800 grams per day. Fish and fish products should be consumed at least twice per week.

The Lithuanian dietary guidelines are to eat bread and grains several times per day, to eat a variety of vegetables and fruits (at least 400 g per day) and to replace fatty meat with fish. The Lithuanian Food pyramid includes 3-5 portions of vegetables and 2-4 portions of fruit.

Norwegian health authorities recommend an increased intake of whole-grain cereals, fish, potatoes, vegetables and fruit. Quantitative recommendations are only given for fruit, vegetables and potatoes. At least 2 servings of fruit and berries and 3 servings of vegetables (incl. potatoes) per day, or about 750 grams of fruit, vegetables and potatoes per day, are recommended (National Nutrition Council, 1996). The slogan “Five a Day” has been used by Norwegian vegetable wholesalers since the beginning of the 1990s, and by health authorities since 1997.

Swedish Diet and Health recommendations were introduced in the late 1960s and subsequently advised a general increase in the consumption of vegetables, fruit, potatoes and bread (Allmänna Förlaget, 1992). Quantified recommendations for vegetable and fruit consumption of about 500 g per day were introduced in 1999 (Becker & Hagman, 1999).

The WHO (World Health Organization, 1990; World Health Organization, 2003) recommends consumption of vegetables and fruit (excluding potatoes and other tubers) of at least 400 g per day. The World Cancer Research Fund (World Cancer Research Fund, 1997) recommend 400-800 g per day, or 5 or more portions a day, of a variety of vegetables and fruits, all year-round. Pulses (legumes), and starchy vegetables and fruits (tubers, starchy roots and plantains) are not included to the recommendation of vegetables and fruits. A variety of cereals (grains), pulses (legumes), roots, tubers and plantains are recommended to eat 600-800 g or more than seven portions a day.

Table 4. Summary of dietary guidelines in Nordic and Baltic countries

	DEN	EST	FIN	ICE	LAT	LIT	NOR	SWE
Vegetables	600g	3-5 p	500g *	5p/ 500g	400g	400g, 3-5 p veg / 2-4 p fruit	750 g / 3 p veg incl. potatoes	500 g
Fruits and berries		2-4 p						
Potatoes		3-5 p			800g	5-11 p cereals and potatoes	2 p fruit	
Bread		6-8 p of cereals	6-9 s *					
Fish	200- 300 g / week	2-3 x	2x		2x			

p: portions per day; s: slices per day; x: times per week; *: not an official guideline.

1.4 National promotion activities

Promotion of increased consumption of vegetables, potatoes, fruit, whole-grain cereals and fish tends to be an integral part of nutrition education and health promotion in the Baltic and Nordic countries. Nongovernmental organisations (NGOs) and marketing boards for bread, fish and vegetables have also carried out campaigns. In the last ten years, broad national initiatives to promote the consumption of fruits and vegetables in co-operation between health authorities, NGOs and marketing organisations have been launched in the Nordic countries. These initiatives have included projects such as “Fruits and vegetables against cancer”, “Fruits and vegetables at school” and “green canteens” at worksites. In the 1990s a vast promotion campaign for fish was launched in Denmark by the marketing board for fish. At the same time the accessibility of fresh fish was improved at retailers.

In Finland, promotion of vegetable and fruit, bread and cereal as well as fish consumption has taken place not only through the National Nutrition Council (e.g. the official dietary guidelines), but also through the activities of several information organizations: Kotimaiset Kasvikset ry. /Inhemska trädgårds producer rf. has carried out several campaigns supporting an increase in vegetable and fruit consumption. The latest campaign, “Puoli kiloa päivässä” (half a kilo per day), made substantial use of the media (e.g. magazines, TV and the Internet). Bread and cereal promotion is mainly done by the “Leipätiedotus” (The Finnish Bread Information). Their efforts focus on whole-grain cereal products, especially rye products. The currently ongoing campaign, “Nauti vapaasti viljasta” (enjoy cereals freely) advises consumers to increase both the frequency with which they eat bread and cereal products and the portion size of these food items. Promotion of fish consumption is supported in Finland by the “Pro Kala ry” (Pro Fish Association), which maintains a wide spectrum of activities. All of the above organizations provide basic information and nutritional facts about the foods they represent, as well as recipes that expand the consumer’s range of options for preparing these foods.

In the Baltic countries, nutrition promotion activities started in the second half of the 1990s. Estonia has had more initiatives than the other Baltic countries, including a healthy school food project and a heart health project begun in 1996 and a rye bread project underway since 1998. Other health initiatives and local projects as well have included recommendation of fruit and vegetables, fish and high-fibre bread as part of everyday healthy nutrition. The “Five a Day” target was introduced by the Estonian Nutrition Society in 2001, and a broader “Five a Day” campaign to increase fruit and vegetable consumption started in 2003 (Estonian Nutrition Society, 2002). In Latvia promotion of fruit, vegetable and bread consumption has been included in healthy nutrition programs at schools and in several local projects. In Lithuania, promotion of vegetable and fruit consumption, as well as of potato, cereal and fish consumption, is included in the activities of certain health promotion and disease prevention programmes. Lithuania joined the WHO CINDI (Countrywide Integrated Noncommunicable Disease Intervention) program in 1983. The CINDI dietary guide includes advice on vegetable and fruit consumption (“Eat a variety of vegetables and fruits several times per day, at least 400 g per day”), and also on cereal and potato consumption (“Eat bread, cereals and potatoes several times per day”). The dietary guide is used for public education and for the training of health professionals in special training courses developed at Kaunas University of Medicine. The topic of vegetable and fruit consumption and its connection to health is also included in the curriculum for schoolchildren. The aim is to increase the awareness and knowledge level of children and instill healthy eating habits early on. The Healthy School Project and Healthy Kindergarten Project support healthy eating habits by encouraging the availability of vegetables and fruit for children in the canteens. Training courses for canteen staff are being developed as well. In autumn the municipal governments of some cities, in coordination with the Healthy City project, organize a Harvest Day to promote locally grown vegetables and fruit. In 1997 certification of ecological fruit and vegetables was introduced in Lithuania.

Several networks have been efficiently involved in healthy nutrition initiatives both in Nordic and in Baltic countries: health-promoting schools and nursery schools, hospitals and cities.

2 Aims of the study

The main aims of the NORBAGREEN study were twofold:

- 1) The main aim, intended to address the lack of cross-nationally comparable data, was to study the average frequency of consumption of vegetables, potatoes, fruit, bread and fish, as well as the proportions of regular, low and high consumers, with a unified method in the Nordic and Baltic countries.
- 2) The methodological aim was to produce and validate a food frequency questionnaire (FFQ) for the Nordic and Baltic countries that would effectively record the frequency of consumption of foods considered to be dietary health indicators, i.e. vegetables, fruit, bread and fish.

A secondary aim of the study was to compare the results with current dietary guidelines. This publication reports the results of the study for all countries, for all respondents and for men and women separately.

3 Samples and methods

3.1 Samples

3.1.1 Sample of the main study

The study was carried out in eight northern European countries: in the Nordic countries (Finland, Sweden, Norway, Denmark and Iceland) and in the Baltic countries (Estonia, Latvia and Lithuania). Additionally, a ninth study area was formed in Finland, i.e. the island Åland, where a separate representative sampling was carried out to obtain information about food consumption in that region of Finland. However, the sampling of mainland Finland was done similarly as for the other countries. The interviews in all countries were carried out in April-May 2002; they were co-ordinated by TOY Research (Taloustutkimus Oy) in Finland. Other research companies that co-operated with TOY Research are listed in Table 5.

The interviewing method used in the Nordic countries was a Computer Assisted Telephone Interview (CATI). In the Baltic countries a Paper Assisted Personal Interview (PAPI) was used. In Finland, Norway and Iceland the interviews were carried out ad hoc; in the other countries they were part of an omnibus.

The number of completed interviews was approximately 1000 in each country. In addition, 250 residents of Åland were interviewed. The total number of completed interviews was 8397. The age of the respondents was 15-74 years (in Sweden and in Denmark 16-80 years). The proportion of completed interviews among total contacts (completed and refused interviews) in each country is presented in Table 5. The number of contacts needed to obtain about 1000 interviews/country differed between countries. In every country, however, the requirement of an area, sex, and age-group representative sample was met. The weighting of the data for each country was performed on the basis of area, sex and age (see example in Appendix 5).

The CATI samples in the Nordic countries were randomly drawn from the household telephone directory, except for Iceland, where the sample was randomly drawn from

the national register. Mobile phone numbers were included in Finland and in Iceland. Within households, respondents were selected by using the last-birthday or next-birthday method: the person in the household who was last/next in line to have his/her birthday was selected. If this person was not at home, a time for an interview was scheduled. All phone numbers were called at least three times.

In the Baltic countries sampling points (120 each in Estonia and Latvia, 100 in Lithuania) were used to select the PAPI samples. The sampling points were chosen according to national population-statistical data, taking into consideration the population density in each region. In Estonia the starting address method and the younger man's rule were used to select respondents in cities and towns, whereas in villages and in the countryside respondents were randomly chosen from the list of residents. In Latvia the starting address method was used to select households; the selection of respondents within households was done with a Kish table. In Lithuania the selection of households was carried out in towns using the random route procedure and the starting address method; within households respondents were selected using the birthday rule or a Kish table. Table 5 presents details on the sampling methodology.

Demographic background questions asked in all countries covered age, gender, geographical region, rural vs. urban residence, marital status, highest education level attained and years of full-time education after compulsory school, total annual household gross income, work status, trade/profession, family situation, number of children under 18 years at home, and (except in Iceland) ethnicity. (See Appendix 3 for a full listing of demographic background questions.) In addition, the native language was established in Finland, Estonia, Latvia and Lithuania. In Sweden, Norway and Iceland it was recorded whether the interview was carried out before or after the day of publication of research results on the presence of acrylamide in a range of common food products. Respondents in every country were also asked whether they were vegetarians or not (cf. Appendix 2).

Table 5. Methodological information of the study

	Finland	Åland	Sweden	Norway	Denmark	Iceland	Estonia	Latvia	Lithuania
Collaborating research company	TOY Research	TOY Research	GfK Sverige AB	Opinion AS	Gfk Danmark A/S	Gallup Iceland	ES Turu-uuringute AS	Latvian Facts	Vilmorus Ltd
Method	CATI	CATI	CATI	CATI	CATI	CATI	PAPI	PAPI	PAPI
Omnibus / ad hoc	Ad hoc	Ad hoc	Part of telebus	Ad hoc	Part of telebus	Ad hoc	Part of omnibus	Part of omnibus	Ad hoc
Sampling ¹	Randomly: household numbers + mobile phones	Randomly: household numbers	Randomly: household numbers	Randomly: household numbers	Randomly: household numbers	Randomly: national register, mobile phones incl.	Sampling points	Sampling points	Sampling points
N	1009	250	1005	1000	999	1002	996	1060	1076
Weighed N	1008	250	983	997	997	1002	996	1060	1076
Proportion of completed interviews among all contacts (%)	50	84	74	50	27	70	75	82	67
Age of respondents (years)	15-74	15-74	16-80	15-74	16-80	15-74	15-74	15-74	15-74
Language(s) of the questionnaire	Finnish	Swedish	Swedish	Norwegian	Danish	Icelandic	Estonian Russian	Latvian Russian	Lithuanian Russian
Missing answers to food questions (%)	< 1	< 1	< 3	< 2	< 2	< 4	< 9	< 4	< 3

CATI = Computer Assisted Telephone Interview, PAPI = Paper Assisted Personal Interview

¹ Selection methods used: In the Nordic countries (excl. Iceland), last/next birthday method; in the Baltic countries, one or more of the following: starting address method, random route procedure, younger man's rule, last/next birthday method, Kish table.

3.1.2 Samples of the validation studies

The validation studies were carried out in two of the NORBAGREEN countries: Finland and Lithuania. Reference methods were 2 x 3-day food records in Finland and 4 x 24-hr recall in Lithuania.

Sample of the Finnish validation study

The Finnish validation study was carried out in spring (January-May) 2002 (FFQ1 and a 3-day food record) and in autumn (October-December) 2002 (FFQ2 and a 3-day food record) in connection with the National FINDIET 2002 Study (Männistö *et al.*, 2003). Of the 222 subjects who completed FFQ1, 73 did so in the spring and provided 3-day food records in the spring and in the autumn (to test the external validity of the FFQ) and 71 completed FFQ2 (to test the reproducibility of the FFQ). The FFQ1 and FFQ2 included identical food consumption questions.

Sample of the Lithuanian validation study

The sample of 100 citizens of Kaunas was selected from the list of participants of the CINDI Health Monitor Study (aged 20-64) and from the list of patients of the Kaunas Medical University Hospital (aged 15-19 and 65-75). Only those who agreed to participate in the study were included in the sample. One person changed home address during the study. In total, data from 99 persons were analysed. The sample was divided into four equal groups (one group per interviewer). The data were collected by means of face-to-face interviews, which took place in the respondents' homes.

In April 2002 the first FFQ (FFQ1) was filled out by subjects and the first 24-hr recall interviews conducted. The second 24-hr recall interviews were conducted in May-June, and the third in August-September. In October the second FFQ (FFQ2) was filled out and the fourth 24-hr recall obtained.

3.2 The NORBAGREEN FFQ

3.2.1 The FFQ of the main study

The NORBAGREEN food frequency questionnaire (FFQ; see Appendix 2 for the English version) was prepared by modifying and expanding the FFQ of the preceding NORDGRÖNT project (1996-1998). The NORDGRÖNT FFQ had been validated in Sweden (Persson & Becker, 2002). After the translation of the FFQ from Swedish to English and then to the nine target languages (in addition to native versions, three Russian versions of the questionnaire were used in the Baltic countries), retranslation from the target languages back to English was carried out to assure the uniformity of the FFQ across countries. The questionnaire was pretested in the participating countries. Some minor country-specific modifications were allowed (up to three additional food (sub)types per country).

The FFQ contained frequency questions regarding total consumption of vegetables, fruit and berries, potatoes, bread and fish. In addition it asked about consumption of different preparation forms (cooked, fried, dried, etc.) of vegetables, fruit, berries and potatoes and about consumption of individual vegetables, fruits and berries. The consumption of fish was recorded separately for fish as a main dish and fish as a side dish. The FFQ established total consumption of bread, as well as consumption of bread types that differ in fibre content. The fibre contents for the three bread categories are presented in the English version of the FFQ (Appendix 2). The breads typically consumed in each country were assigned to the three categories by the researcher responsible for the project in that country. In Sweden consumption of rye crisp was recorded separately, whereas in the other countries rye crisp was included with the high-fibre bread class. For comparability across countries, the rye crisp data were added to the high-fibre bread data for Sweden before statistical analyses.

The respondents were asked how often they usually ate certain foods; they were instructed to think about their average consumption over the past year when answering the questions. They were asked to omit snacks or meal components for which the portion size had been well below normal (e.g. one slice of cucumber on a sandwich, or a

little piece of parsley for decoration). Bread consumption was counted in slices. The following categories were used for breads: bread containing fibre > 6 g/100 g or 3 g/slice ('whole-grain bread'), bread containing fibre 3-6 g/100 g or 1.5-3 g/slice ('semi-whole-grain bread') and bread containing fibre < 3 g/100 g or < 1.5 g/slice ('white bread').

3.2.2 The FFQ of the validation study

The Finnish and Lithuanian FFQs of the validation studies were translated from the English version of the FFQ, which in turn was a modified and expanded version of the FFQ of the NORDGRÖNT project. The questionnaire was pretested before the validation studies. Details were as described in the previous section.

3.3 Statistical analyses

3.3.1 Statistical analysis of the main study

Proportions (percentages) of different types of consumers--daily consumers, low consumers, and high consumers--were estimated. Low consumers of vegetables, potatoes, fruit and fish were those subjects who consumed these foods less than once a week; low consumers of bread were those subjects who did not consume bread daily. High consumers of potatoes consumed potatoes twice a day or more, high consumers of fish consumed fish five or more times a week. In addition, figures were established for subjects who consumed fish once a week or more, bread five or more slices (high consumption for women) and seven or more slices (high consumption for men) a day and those who consumed three or more slices of bread of one of the three classes of fibre content.

The means and 95% credible intervals (Bayesian confidence intervals) for proportions of different consumers were calculated. The credible intervals were calculated for the differences in consumption between countries and genders, and weight factors (for representativeness of the sample by sex, age and area) were applied. The analysis of binomial proportions of different consumer types was chosen because the data were

both irregularly distributed and required weight factors. Bayesian confidence intervals were preferable to traditional confidence intervals because they are always contained within [0,1] for binomial proportions.

In order to obtain values that would permit easy comparison of total consumption between countries, average figures of consumption for all subjects were calculated as well. These average consumption figures are indicative, but do not reveal distributions. However, the distributions did not differ strongly between countries. Average consumption per month was calculated using a factor of 4,3 (30/7) to convert frequencies per week and a factor of 30 to convert frequencies per day. In addition, average consumption per day was calculated for the global questions.

3.3.2 Statistical analysis of the validation studies

Frequencies were converted to figures for consumption per month before the analysis: frequency per week was multiplied by a factor of 4,3 (30/7) and frequency per day was multiplied by a factor of 30. The reference methods for measuring the external validity of the FFQ were 2 x 3-day food records in the Finnish validation study and 4 x 24-hr recalls in the Lithuanian study. Consumption frequencies were calculated from the 2 x 3-day food records and the 4 x 24-hr recalls and were multiplied by a factor of 5 and by a factor of 7,5, respectively, to convert them to consumption frequencies per month. Reproducibility between FFQ1 and FFQ2 was studied in both validation studies.

The nonparametric Spearman correlation coefficient was chosen because the data from FFQs and reference methods were not normally distributed. Paired t-test was used to measure the statistical significance of the differences. Parametric paired t-test was chosen because the differences tended to be normally distributed even though the values were not. When studying the external validity of the vegetable data the analyses were carried out twice: for all portions of vegetables from food records and from 24-hr recalls, and for vegetable portions ≥ 40 g only.

4 Results

4.1 Results of the main study

Average frequencies of consumption and the proportions of consumers with different consumption frequencies for vegetables, potatoes, fruit, fish and bread are presented in Tables 6-10 and Figures 1-13. The basic frequency data derived from every food question (total consumption, consumption of differently prepared forms, individual vegetables and fruits, fish as main dish and side dish and breads with different fibre content) are presented regrouped into six classes in Appendix 1, A Figures 1-58. They are shown by country, for all respondents and for men and women separately. Average frequencies of consumption per month are presented in these figures as well.

Average frequency of consumption per day according to the global questions (one per food group) are presented in Table 6 for all respondents and in Table 7 separated out for men and women. The average consumption frequency of vegetables was highest in Sweden, Finland, Latvia and Lithuania and that of potatoes was highest in the Baltic countries, Finland and Iceland. Average consumption of fruit was higher in the Nordic compared to the Baltic countries. Fish was eaten most often in Norway and Iceland. Bread was eaten most often in the Baltic countries, in Finland and Norway.

In most countries higher average consumption frequencies were seen among women for vegetables and fruit and among men for bread. For potatoes and fish there were no differences between sexes in average consumption frequencies.

Table 6. Frequency of consumption per day (mean) measured by one global question per food group, by country for all respondents. Vegetables, potatoes, fruit and fish: times a day. Bread: slices a day.

	Vegetables, total	Potatoes, total	Fruit, total	Fish, total	Bread, total
Finland (n=1009)	1,1	0,8	1,0	0,2	4,7
Åland (n=250)	0,9	0,8	0,9	0,2	4,3
Sweden (n=1005)	1,3	0,6	1,2	0,2	3,7
Norway (n=1000)	0,9	0,6	1,0	0,3	4,6
Denmark (n=999)	0,9	0,6	0,9	0,2	3,6
Iceland (n=1002)	0,8	0,8	0,7	0,3	2,6
Estonia (n=996)	0,7	0,9	0,6	0,2	4,7
Latvia (n=1060)	1,2	0,9	0,7	0,3	5,0
Lithuania (n=1076)	1,1	0,9	0,7	0,2	4,4

NORBAGREEN 2002

Table 7. Frequency of consumption per day (mean) measured by one global question per food group, by country for men (M) and women (W). Vegetables, potatoes, fruit and fish: times a day. Bread: slices a day.

	Vegetables, total		Potatoes, total		Fruit, total		Fish, total		Bread, total	
	M	W	M	W	M	W	M	W	M	W
Finland	0,9	1,2	0,8	0,8	0,8	1,1	0,2	0,2	5,1	4,4
Åland	0,8	1,0	0,8	0,7	0,6	1,1	0,2	0,3	4,9	3,7
Sweden	1,1	1,5	0,6	0,6	1,1	1,4	0,2	0,2	4,0	3,4
Norway	0,8	0,9	0,6	0,6	0,8	1,1	0,3	0,3	5,3	3,8
Denmark	0,8	1,1	0,6	0,6	0,8	1,1	0,2	0,2	4,2	2,9
Iceland	0,7	0,9	0,8	0,7	0,6	0,8	0,3	0,3	3,0	2,1
Estonia	0,7	0,8	1,0	0,9	0,5	0,7	0,2	0,2	5,2	4,3
Latvia	1,2	1,2	0,9	0,9	0,7	0,8	0,3	0,2	5,8	4,4
Lithuania	1,0	1,1	0,9	0,9	0,7	0,8	0,2	0,2	5,1	3,8

NORBAGREEN 2002

4.1.1 Consumption of vegetables

The proportion of daily consumers of vegetables (total consumption) was highest in Sweden, Finland, Åland, Latvia and Lithuania (Fig.1). Sweden and Estonia differed significantly from the other countries in that they had the highest and the lowest

proportion of daily consumers, respectively. The proportion of low consumers, i.e. those that consumed vegetables less than once a week, was under 10% in every country; it was relatively highest in Denmark, Iceland and Estonia.

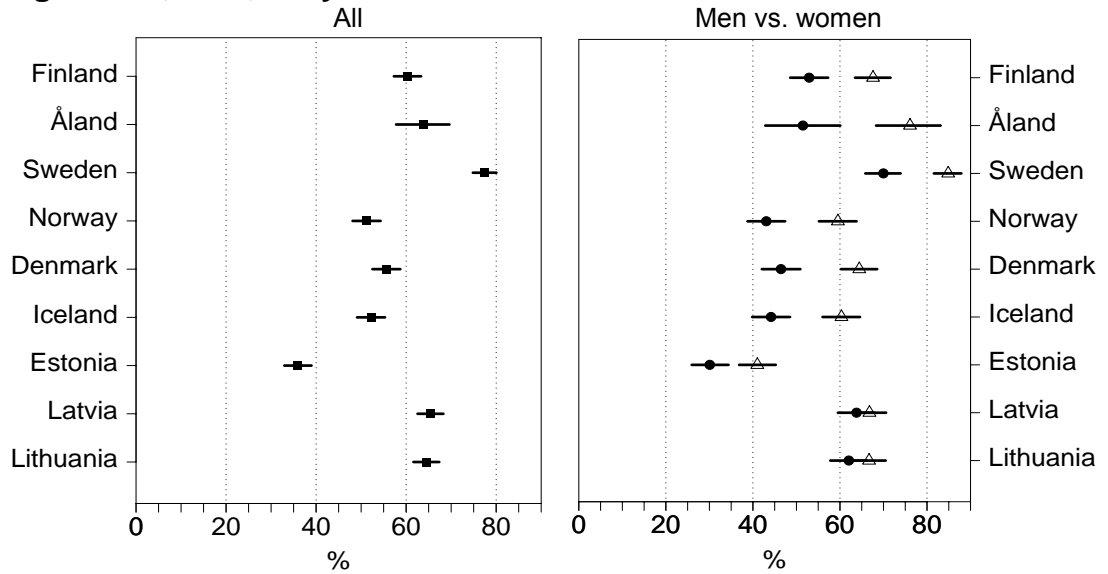
In the Nordic countries the pattern of daily consumption of fresh vegetables was in relation to that for all vegetables (Fig. 1). In Latvia and Lithuania the daily consumption of fresh vegetables was clearly less compared to the total consumption of vegetables. The proportion of daily consumers of fresh vegetables did not differ between Baltic countries, unlike the consumption of total vegetables. Fresh vegetables were consumed less than once a week by under 10% of subjects in Finland, Åland and Sweden and by 10-20% in the other countries (Fig. 2). Consumption of vegetable and root dishes and vegetable or root juice seemed to be more common in the Baltic countries than in the Nordic countries (Appendix 1, A Fig. 6).

A larger proportion of women than men consumed vegetables daily in most countries except Latvia and Lithuania. The proportion of daily consumers of fresh vegetables was higher among women than men in five of the eight countries.

The proportion of subjects who responded that they were eating a vegetarian diet (including fish or not) was 2-3% in all countries, except in Sweden, where the proportion of vegetarian subjects was 7%. When those self-described vegetarians eating fish were excluded from the groups, leaving only vegans, lacto-vegetarians or lacto-ovo-vegetarians, the proportion was less than 2% in all countries.

The ten most popular vegetables in each country and the proportion of the sample consuming them almost daily are presented in Table 8a; the ten most popular vegetables according to the average consumption data are shown in Table 8b. Onions, cucumbers, tomatoes, and carrots were among the most popular vegetables in all countries. Green salad and sweet pepper were more popular in the Nordic countries than in the Baltic countries. Cabbage was popular in the Baltic countries, but also among the top ten for the Nordic countries except Norway and Denmark (Tables 8a,b).

Vegetables, total, daily consumers



Fresh vegetables, daily consumers

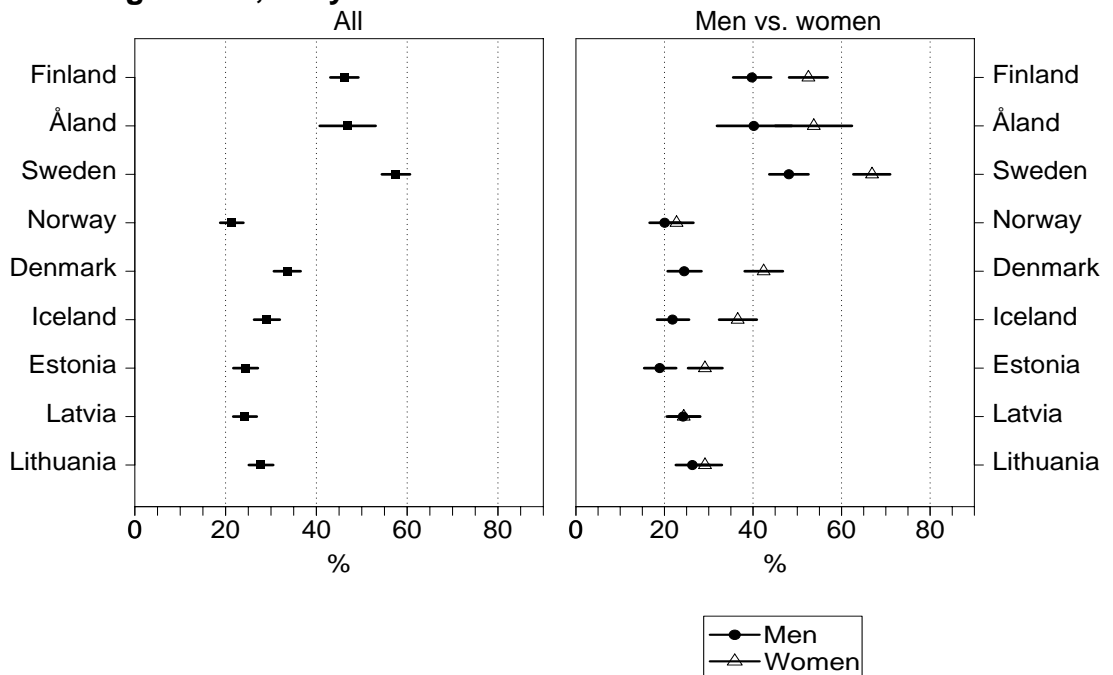
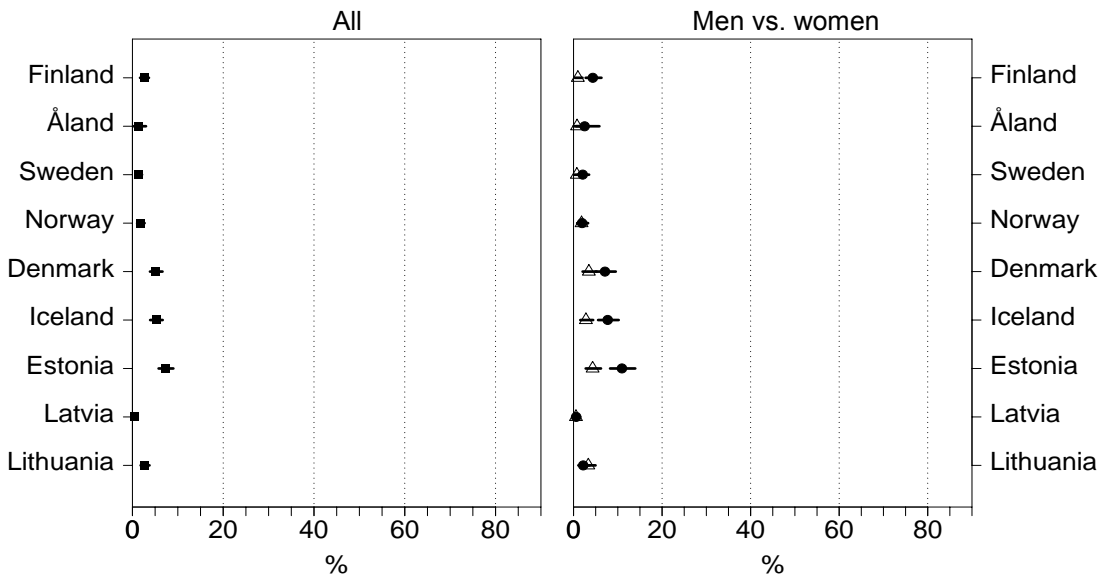


Figure 1. Proportion of daily consumers (mean and 95% Bayesian confidence intervals) of total vegetables and fresh vegetables by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

Vegetables, total, low consumers (less than once a week)



Fresh vegetables, low consumers (less than once a week)

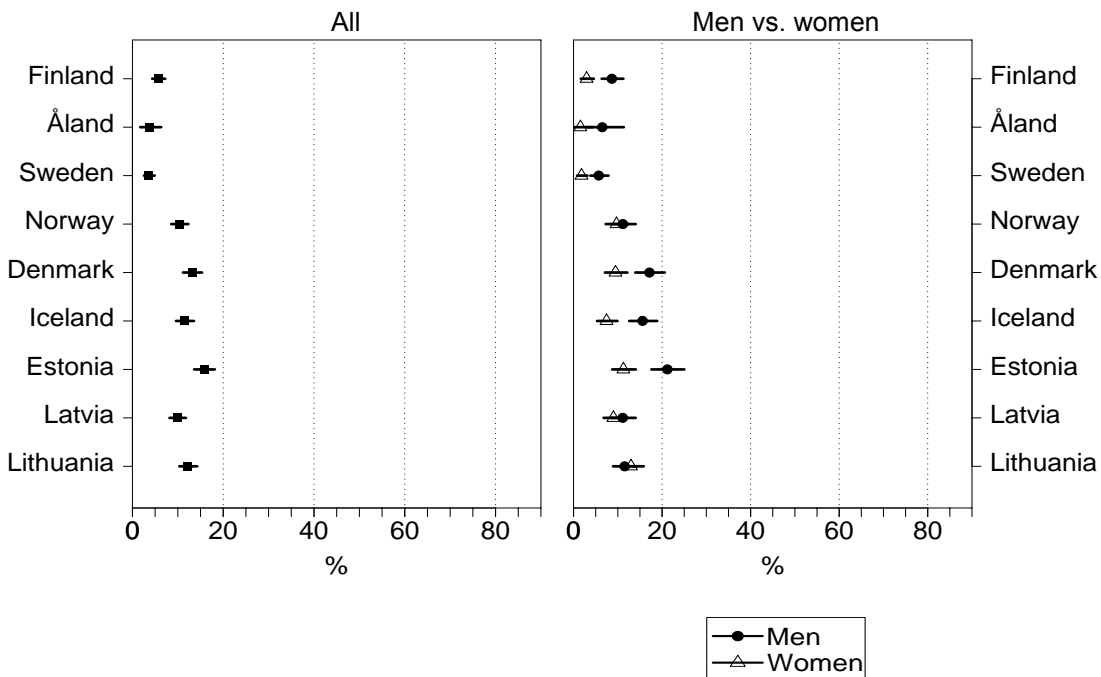


Figure 2. Proportion of low consumers (mean and 95% Bayesian confidence intervals) of total vegetables and fresh vegetables by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

Table 8a. The 10 most popular vegetables in each country and the proportion of the sample (%) consuming them almost daily (five times a week or more).

Finland	Åland	Sweden	Norway	Denmark	Iceland	Estonia	Latvia	Lithuania
Onion, leek, garlic 53	Onion, leek, garlic 48	Tomato 47	Cucumber 29	Cucumber 40	Cucumber 23	Onion, leek, garlic 58	Onion, leek, garlic 57	Onion, leek, garlic 67
Cucumber 51	Tomato 42	Cucumber 42	Tomato 28	Tomato 35	Tomato 20	Carrot 21	Carrot 25	Carrot 33
Tomato 44	Green salad 38	Green salad 27	Onion, leek, garlic 25	Onion, leek, garlic 33	Onion, leek, garlic 20	Cucumber 18	Cucumber 20	Cucumber 18
Green salad 36	Cucumber 37	Onion, leek, garlic 26	Carrot 23	Green salad 21	Green salad 16	Tomato 15	Tomato 14	Tomato 12
Carrot 15	Carrot 12	Carrot 18	Sweet pepper 16	Carrot 21	Sweet pepper 11	Cabbage 10	Cabbage 10	Cabbage 10
Peas, corn, mixed vegetables 9	Sweet pepper 12	Sweet pepper 17	Green salad 11	Sweet pepper 16	Cabbage 7	Sweet pepper 6	Peas, corn, mixed vegetables 7	Red beet 8
Sweet pepper 8	Peas, corn, mixed vegetables 10	Peas, corn, mixed vegetables 12	Peas, corn, mixed vegetables 8	Peas, corn, mixed vegetables 11	Carrot 5	Peas, corn, mixed vegetables 6	Green salad 6	Green salad 7
Cabbage 5	Cabbage 3	Cabbage 4	Broccoli, Brussels sprouts 3	Red beet 7	Peas, corn, mixed vegetables 5	Green salad 5	Red beet 6	Radish, black radish 7
Red beet 3	Red beet 2	Rutabaga, turnip, parsnip, root parsley 2	Rutabaga, turnip, parsnip, root parsley 3	Mushrooms 3	Mushrooms 3	Red beet 5	Foods prepared of dried peas, beans and lentils 5	Peas, corn, mixed vegetables 6
Cauliflower 1	Mushrooms 1	Mushrooms 1	Red beet 3	Broccoli, Brussels sprouts 2	Broccoli, Brussels sprouts 2	Rutabaga, turnip, parsnip, root parsley 4	Sweet pepper 4	Sweet pepper 5

Table 8b. The 10 most popular vegetables in each country according to the average consumption frequency (times/month).

Finland	Åland	Sweden	Norway	Denmark	Iceland	Estonia	Latvia	Lithuania
Cucumber 22,1	Onion, leek, garlic 18,9	Tomato 20,3	Cucumber 14,3	Cucumber 16,7	Cucumber 12,8	Onion, leek, garlic 25,1	Onion, leek, garlic 22,9	Onion, leek, garlic 25,4
Onion, leek, garlic 21,0	Tomato 18,5	Cucumber 18,6	Onion, leek, garlic 13,8	Tomato 15,6	Tomato 11,8	Carrot 12,6	Carrot 14,1	Carrot 16,0
Tomato 18,5	Cucumber 17,7	Onion, leek, garlic 13,9	Tomato 13,3	Onion, leek, garlic 14,6	Onion, leek, garlic 11,5	Cucumber 11,8	Cucumber 11,8	Cucumber 11,9
Carrot 11,0	Green salad 16,8	Green salad 13,3	Carrot 12,7	Green salad 11,6	Green salad 9,7	Tomato 10,0	Tomato 10,0	Cabbage 9,7
Green salad 16,4	Carrot 9,9	Carrot 11,0	Sweet pepper 9,4	Carrot 11,3	Sweet pepper 8,7	Cabbage 8,1	Cabbage 9,1	Tomato 9,3
Peas, corn, mixed vegetables 8,5	Peas, corn, mixed vegetables 9,0	Sweet pepper 10,3	Green salad 8,9	Sweet pepper 9,2	Peas, corn, mixed vegetables 6,5	Peas, corn, mixed vegetables 6,1	Red beet 7,2	Red beet 8,5
Sweet pepper 7,0	Sweet pepper 8,3	Peas, corn, mixed vegetables 9,0	Peas, corn, mixed vegetables 8,2	Peas, corn, mixed vegetables 8,2	Cabbage 6,4	Red beet 5,6	Peas, corn, mixed vegetables 6,8	Peas, corn, mixed vegetables 6,2
Cabbage 4,8	Cabbage 3,9	Mushrooms 4,4	Broccoli, Brussels sprouts 5,0	Red beet 5,6	Mushrooms 6,3	Sweet pepper 5,4	Foods prepared of dried peas, beans and lentils 6,2	Green salad 5,8
Red beet 4,0	Red beet 2,6	Cabbage 3,9	Mushrooms 4,2	Mushrooms 4,8	Carrot 5,8	Green salad 5,1	Green salad 5,8	Radish, black radish 5,2
Cauliflower 2,8	Mushrooms 2,6	Broccoli, Brussels sprouts 3,4	Cauliflower 3,8	Broccoli, Brussels sprouts 3,5	Cauliflower 3,1	Rutabaga, turnip, parsnip, root parsley 3,8	Sweet pepper 5,0	Foods prepared of dried peas, beans and lentils 4,5

NORBAGREEN 2002

4.1.2 Consumption of potatoes

In the Baltic countries, Finland (including Åland) and Iceland the proportion of daily consumers and the proportion of high consumers of potatoes (subjects consuming potatoes twice a day or more) were the biggest (Figs. 3 and 4). The proportion of low consumers of potatoes (less than once a week) varied from Latvia's 1,3% (and Åland's 1,1 %) to Denmark's 8,0 %. Consumption of potatoes did not differ between men and women, except in Iceland, where the proportion of daily consumers of potatoes was larger among men than among women. Cooked potatoes seemed to be the most common form of prepared potatoes in all countries. Fried potatoes and French fries seemed to be more common in the Baltic countries than in the Nordic countries (Appendix 1, A Figs. 28 and 30).

Potatoes, daily consumers

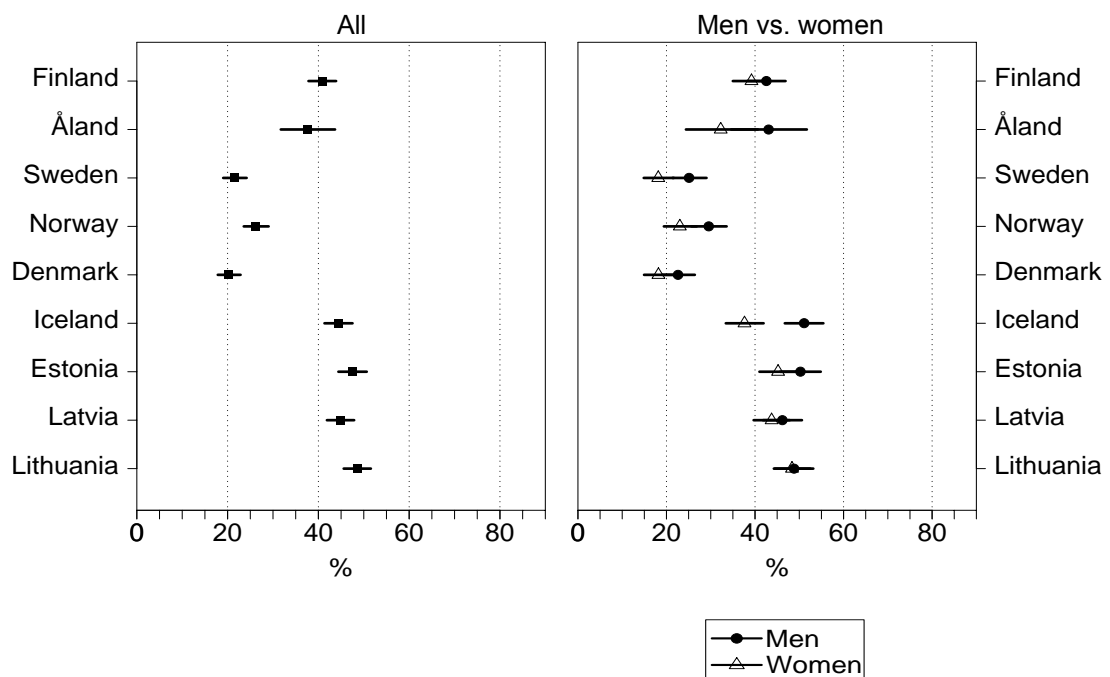
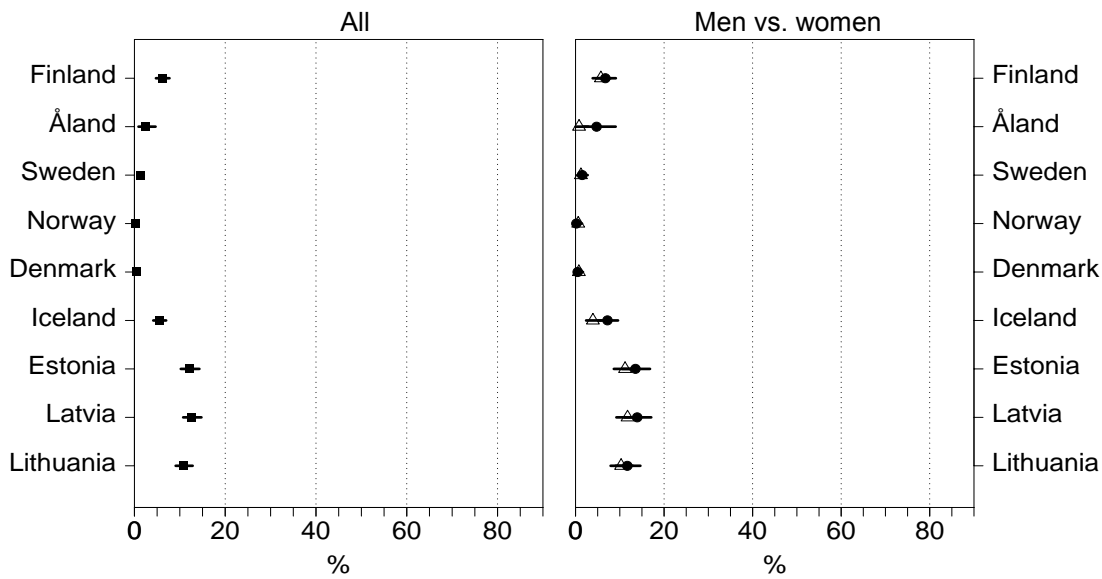


Figure 3. Proportion of daily consumers (mean and 95% Bayesian confidence intervals) of potatoes by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

Potatoes, high consumers (twice a day or more)



Potatoes, low consumers (less than once a week)

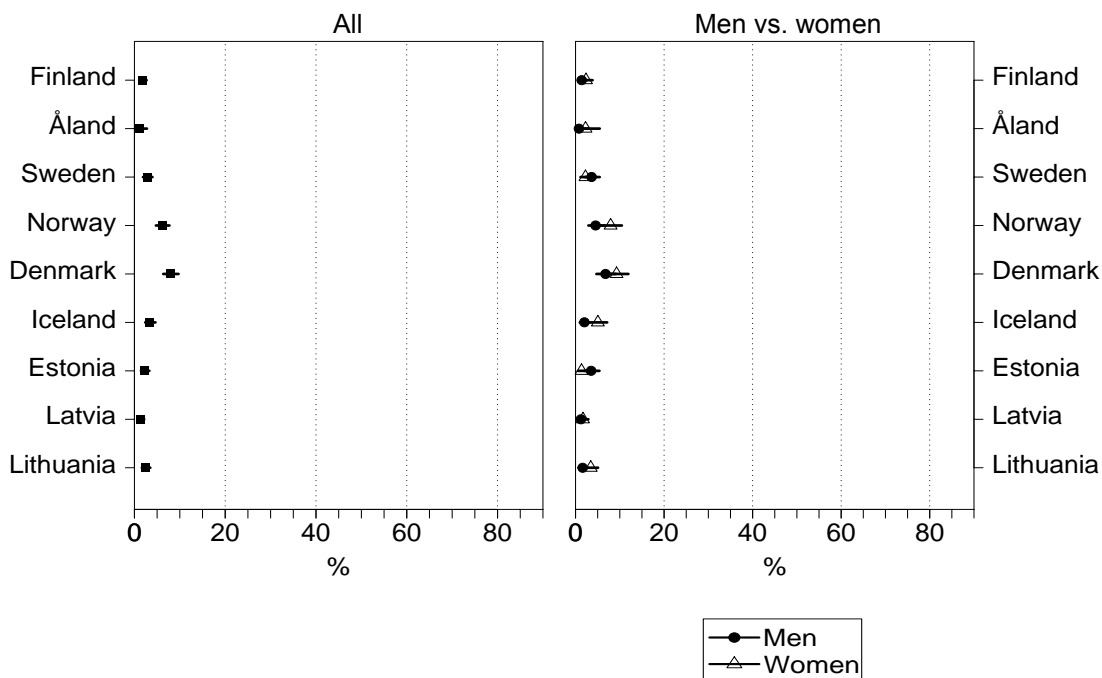


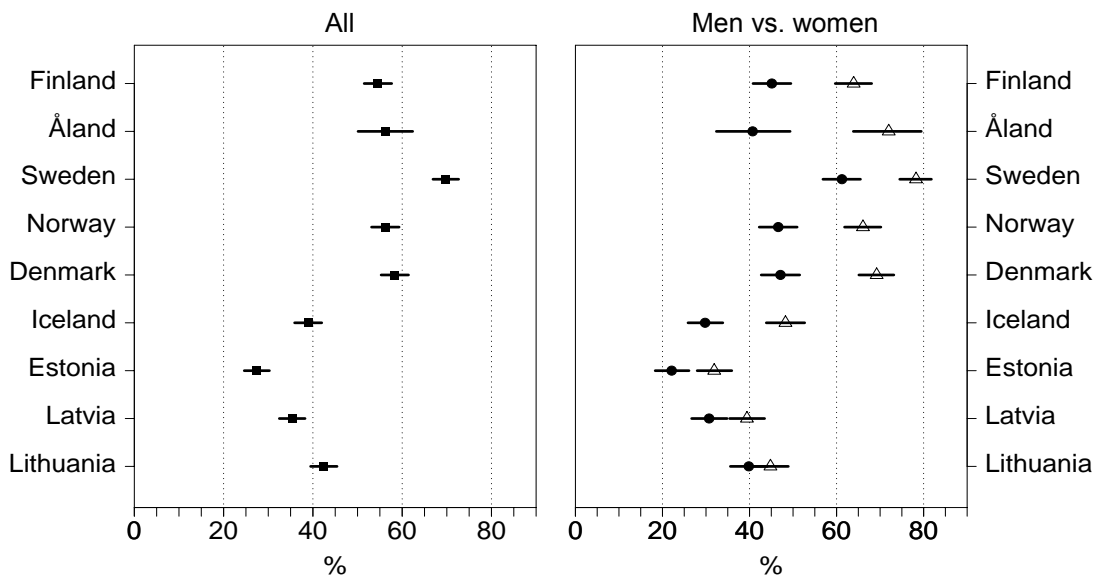
Figure 4. Proportion of high consumers and low consumers of potatoes (mean and 95% Bayesian confidence intervals) by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

4.1.3 Consumption of fruit and berries

Fruit (including berries and unsweetened juices) were consumed more often in the Nordic countries (excluding Iceland) than in the Baltic countries (Fig. 5). The highest proportion of daily consumers of fruit (70%) was seen in Sweden. The consumption of fruit differed within Baltic countries: Lithuania had the highest proportion of daily consumers in the group and Estonia the lowest. Daily consumption of fresh fruit did not differ between the Baltic countries. High consumption of fruit (three times a day or more) was most common in the same countries where the proportion of daily consumers was high. The proportion of low consumers of fruit varied between 3% (in Sweden) and 17% (in Estonia), and the proportion of low consumers of fresh fruit varied between 20% (in Sweden) and 32% (in Estonia) (Fig. 6). A significantly larger proportion of women compared to men consumed fruit and fresh fruit daily in the Nordic countries and in Estonia.

The proportion of daily consumers of unsweetened fruit and berry juice was bigger in the Nordic countries than in the Baltic countries (Fig. 7), being biggest in Finland (including Åland). In Estonia the proportion of daily consumers of fruit juice was significantly bigger than in Latvia and Lithuania, despite the fact that the proportion of total fruit consumers in Estonia was smallest. Consumption of fruit and berry juice did not differ between sexes.

Fruit, total, daily consumers



Fresh fruit, daily consumers

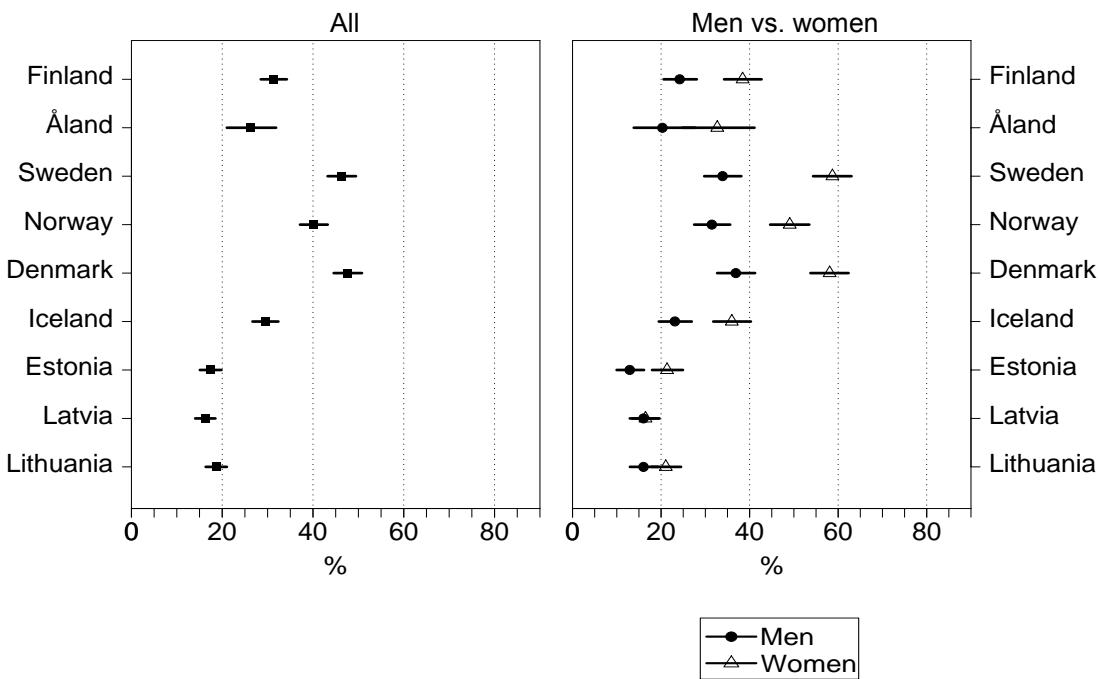
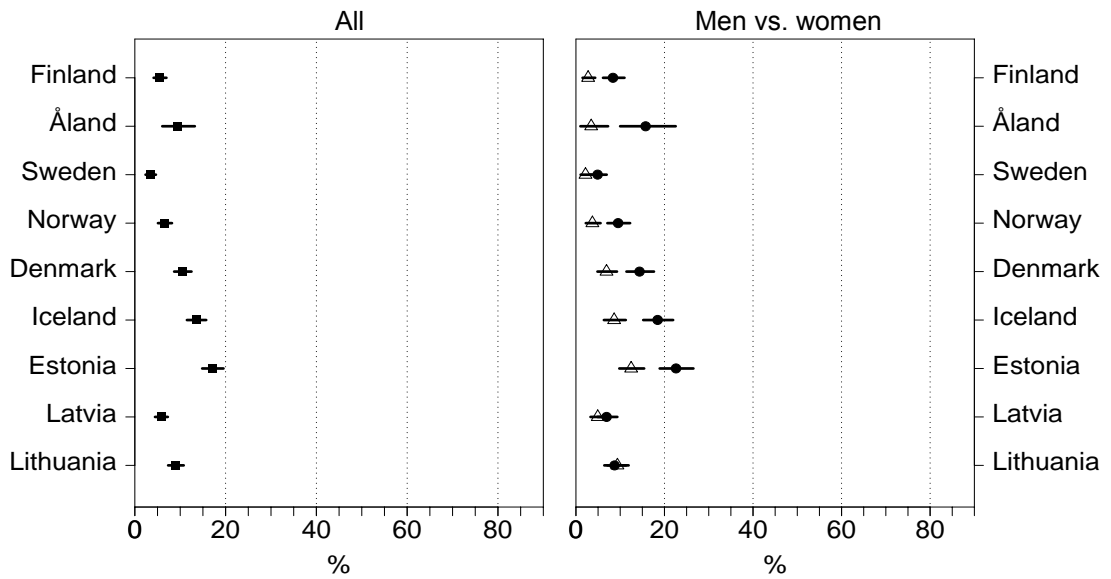


Figure 5. Proportion of daily consumers (mean and 95% Bayesian confidence intervals) of total fruit and fresh fruit by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

Fruit, low consumers (less than once a week)



Fresh fruit, low consumers (less than once a week)

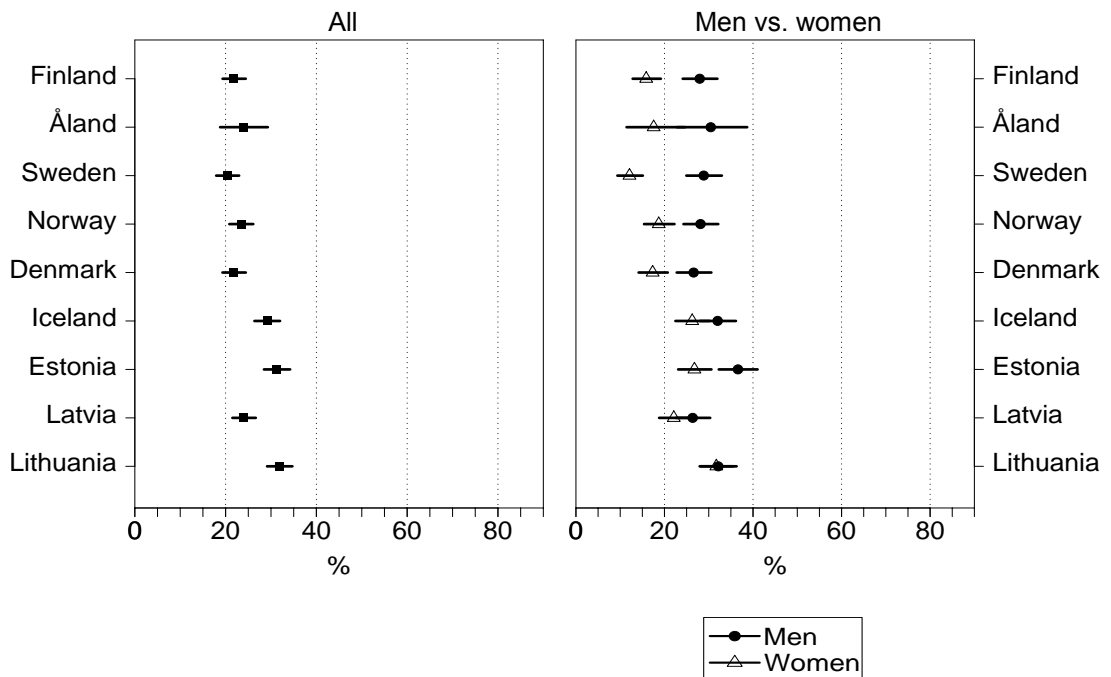
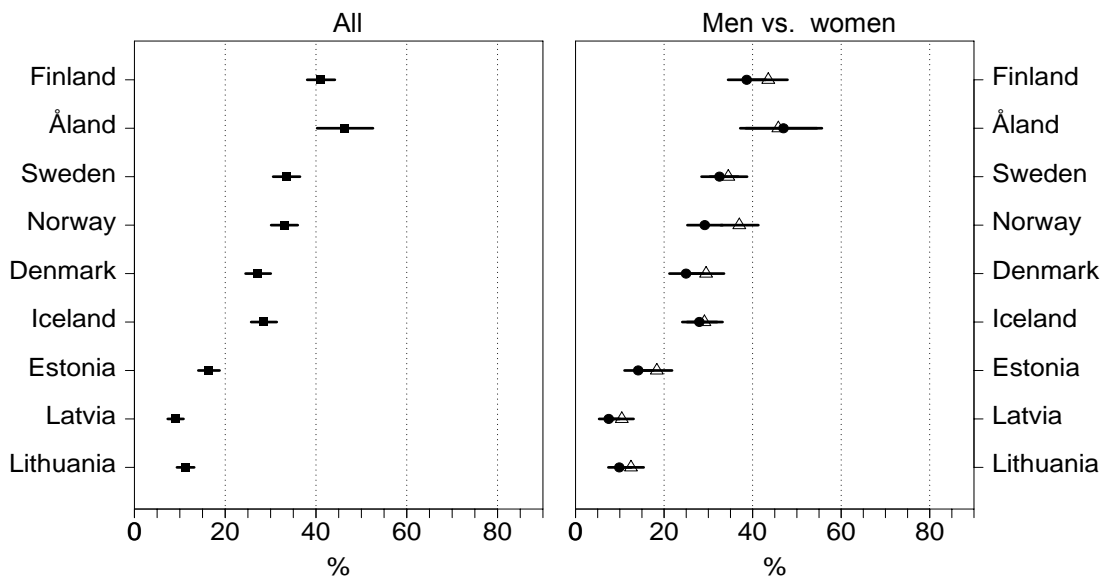


Figure 6. Proportion of low consumers (mean and 95% Bayesian confidence intervals) of total fruit and fresh fruit by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

Fruit and berry juice, daily consumers



Fruit and berry juice, low consumers (less than once a week)

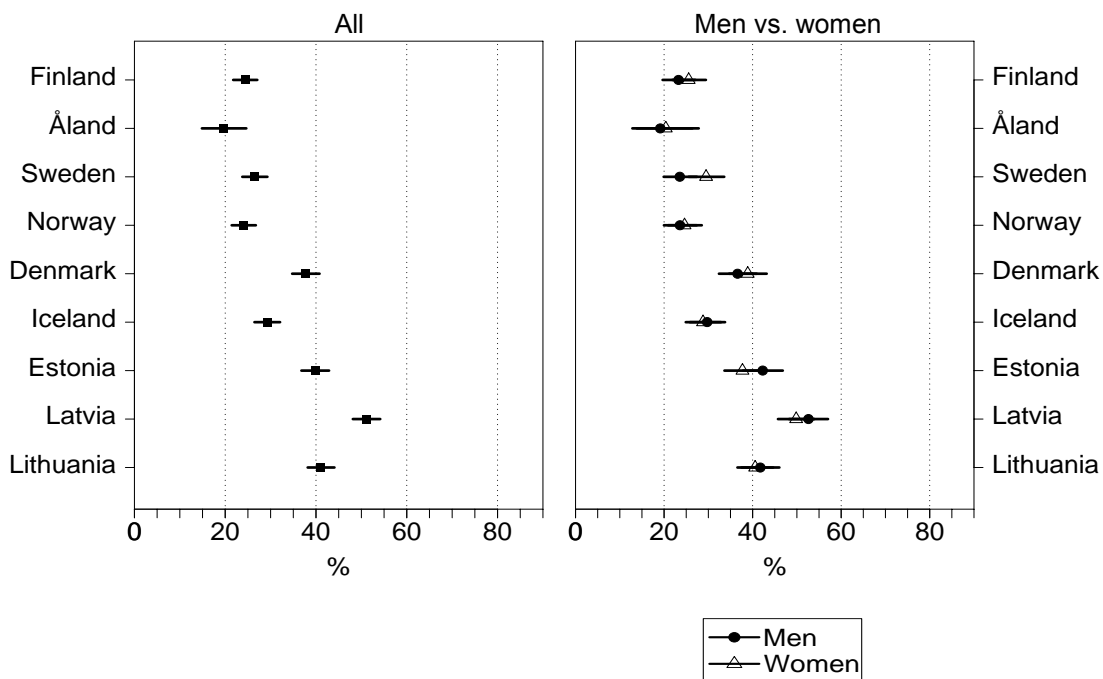


Figure 7. Proportion of daily consumers and low consumers (mean and 95% Bayesian confidence intervals) of fruit and berry juice by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

The ten most popular individual fruits in each country and the proportion of the sample consuming them frequently (three times a week or more) are presented in Table 9a, and the ten most popular fruits according to the average consumption frequency are shown in Table 9b. Apple, citrus fruits and banana were the three most popular fruits in both the Nordic and the Baltic countries (Tables 9a,b). Pears were frequently consumed in all other study areas, but not in mainland Finland. Grapes were frequently consumed in all countries except Lithuania (Table 9a). Kiwi fruit was missing from the top ten list only in Estonia and Finland. Plums and cherries were among the top ten fruits in the Baltic countries and Denmark. Peach, nectarine and apricot belonged to the popular fruits in the Nordic countries, except Finland. Pineapple was commonly used by a small proportion of people in Finland, Norway and Iceland. Melons were favoured by some of the subjects in Norway, Denmark and Iceland.

Berries were consumed most in the Baltic countries and in mainland Finland. For the Baltics and mainland Finland it was typical that several kinds of berries, including wild berries, were on the top ten list of fruit (Table 9b).

Table 9a. The 10 most popular fruit in each country and the proportion of the sample (%) consuming them frequently (three times a week or more).

Finland	Åland	Sweden	Norway	Denmark	Iceland	Estonia	Latvia	Lithuania
Citrus fruits 34	Citrus fruits 39	Apple 47	Apple 49	Apple 52	Banana 43	Apple 51	Apple 45	Apple 67
Apple 33	Apple 39	Banana 39	Citrus fruits 37	Banana 29	Apple 33	Citrus fruits 26	Citrus fruits 26	Citrus fruits 23
Banana 29	Banana 34	Citrus fruits 38	Banana 36	Citrus fruits 28	Citrus fruits 26	Banana 19	Banana 17	Strawberries 16
Blue-, lingon, and cranberries 14	Blue-, lingon, and cranberries 7	Pear 14	Pear 14	Pear 19	Grapes 7	Currants, gooseberries 12	Currants, gooseberries 9	Banana 16
Currants, gooseberries 7	Pear 6	Kiwi 6	Grapes 7	Grapes 7	Pear 7	Pear 12	Strawberries 7	Currants, gooseberries 14
Strawberries 7	Grapes 4	Blue-, lingon, and cranberries 6	Kiwi 5	Strawberries 5	Kiwi 5	Strawberries 10	Plums, cherries 7	Plums, cherries 13
Pineapple 4	Kiwi 3	Strawberries 3	Pineapple 3	Peach, nectarine, apricot 5	Pineapple 2	Raspberries, blackberries 8	Pear 6	Pear 11
Raspberries, blackberries 2	Pineapple 3	Grapes 3	Blue-, lingon, and cranberries 3	Kiwi 5	Melons 2	Plums, cherries 7	Blue-, lingon, and cranberries 6	Raspberries, blackberries 7
Grapes 2	Raspberries, blackberries 3	Peach, nectarine, apricot 3	Melons 3	Plums, cherries 3	Strawberries 1	Blue-, lingon, and cranberries 5	Grapes 6	Blue-, lingon, and cranberries 7
Cloudberries 2	Strawberries 2	Raspberries, blackberries 3	Strawberries 2	Melons 3	Blue-, lingon, and cranberries 1	Grapes 4	Kiwi 5	Kiwi 5

NORBAGREEN 2002

Table 9b. The 10 most popular fruit in each country according to the average consumption frequency (times/month).

Finland	Åland	Sweden	Norway	Denmark	Iceland	Estonia	Latvia	Lithuania
Citrus fruits 11,0	Apple 10,8	Apple 14,2	Apple 14,3	Apple 14,8	Banana 11,5	Apple 15,4	Apple 13,1	Apple 20,1
Apple 10,7	Citrus fruits 10,5	Citrus fruits 11,4	Citrus fruits 10,9	Banana 9,1	Apple 9,8	Citrus fruits 8,4	Citrus fruits 8,9	Citrus fruits 7,9
Banana 9,6	Banana 9,5	Banana 11,3	Banana 10,6	Citrus fruits 8,6	Citrus fruits 8,1	Banana 6,7	Banana 6,3	Strawberries 6,0
Blue-, lingon, and cranberries 5,6	Blue-, lingon, and cranberries 3,1	Pear 5,2	Pear 5,2	Pear 6,0	Grapes 3,8	Currants, gooseberries 5,0	Currants, gooseberries 3,7	Banana 5,9
Strawberries 4,2	Pear 2,6	Kiwi 2,7	Grapes 3,7	Strawberries 3,4	Pear 3,4	Pear 5,0	Strawberries 3,4	Plums, cherries 5,0
Currants, gooseberries 3,5	Strawberries 2,2	Blue-, lingon, and cranberries 2,6	Kiwi 2,2	Grapes 3,0	Kiwi 2,5	Strawberries 4,0	Pear 3,3	Currants, gooseberries 4,9
Pineapple 2,9	Grapes 2,1	Grapes 2,3	Pineapple 2,1	Peach, nectarine, apricot 2,4	Pineapple 1,8	Raspberries, blackberries 3,3	Plums, cherries 3,1	Pear 4,4
Raspberries, blackberries 2,1	Kiwi 2,0	Strawberries 2,3	Strawberries 1,9	Plums, cherries 2,1	Strawberries 1,6	Plums, cherries 3,1	Blue-, lingon, and cranberries 2,9	Raspberries, blackberries 3,1
Grapes 2,0	Pineapple 1,8	Peach, nectarine, apricot 2,0	Peach, nectarine, apricot 1,8	Kiwi 1,9	Melons 1,5	Blue-, lingon, and cranberries 2,5	Grapes 2,6	Blue-, lingon, and cranberries 2,9
Pear 1,6	Raspberries, blackberries 1,5	Raspberries, blackberries 1,5	Blue-, lingon, and cranberries 1,7	Melons 1,8	Blue-, lingon, and cranberries 0,8	Grapes 2,3	Kiwi 2,4	Grapes 2,2

NORBAGREEN 2002

4.1.4 Consumption of fish and shellfish

The proportion of subjects consuming fish once a week or more varied between 55% and 90%, being biggest in Iceland, Norway and Sweden (Fig. 8). The proportion of high consumers (five times a week or more) was less than 10% in all countries (Fig. 9) and was biggest in Norway and Latvia. Low consumers (once a month or less) of fish were relatively most numerous in the Baltic countries, in Denmark and in Finland. No differences between sexes were seen in the proportion of subjects consuming fish once a week, the proportion of high consumers or that of low consumers.

Fish and shellfish, subjects consuming once a week or more

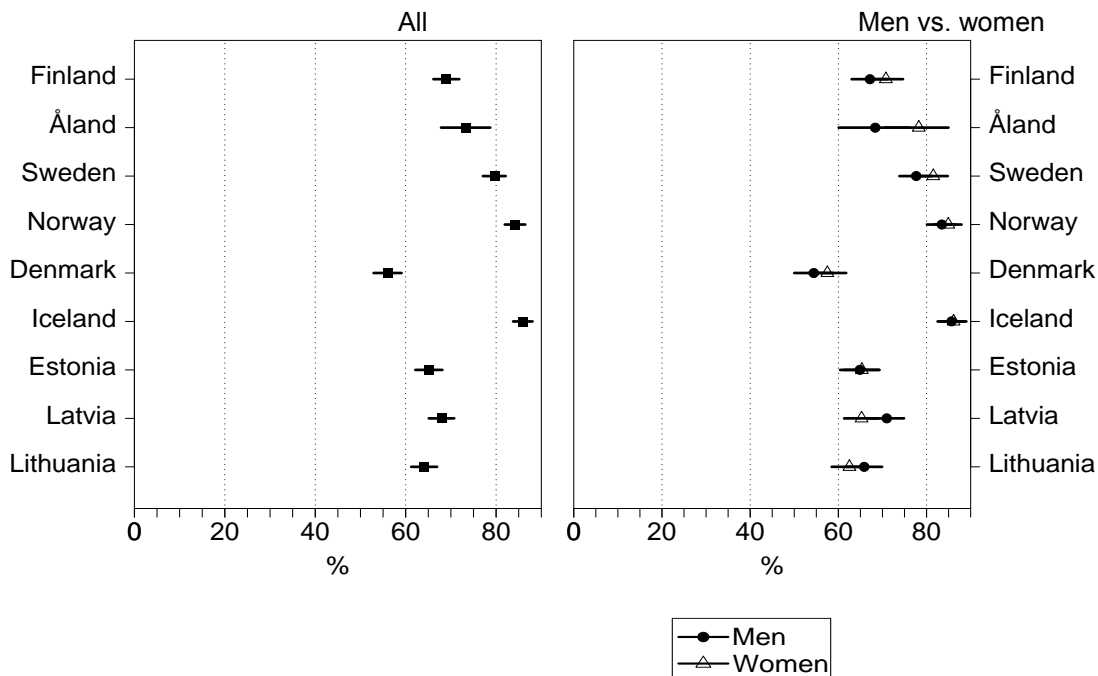
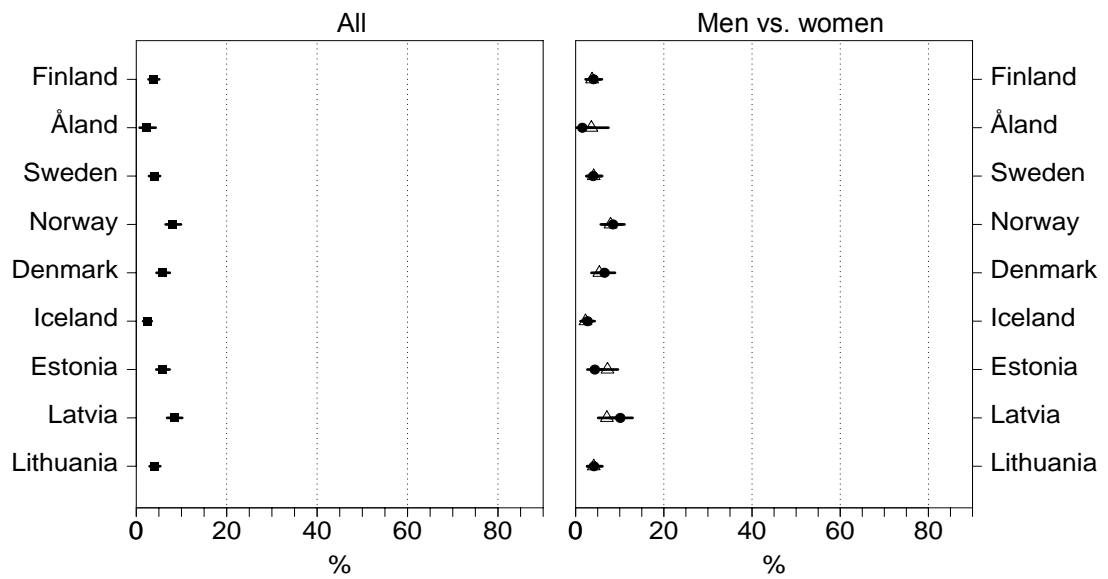


Figure 8. Proportion of subjects consuming fish and shellfish once a week or more (mean and 95 % Bayesian confidence intervals) by country for all respondents and for men and women, respectively. NORBAGREEN 2002.

Fish and shellfish, high-consumers (five times a week or more)



Fish and shellfish, low-consumers (once a month or less)

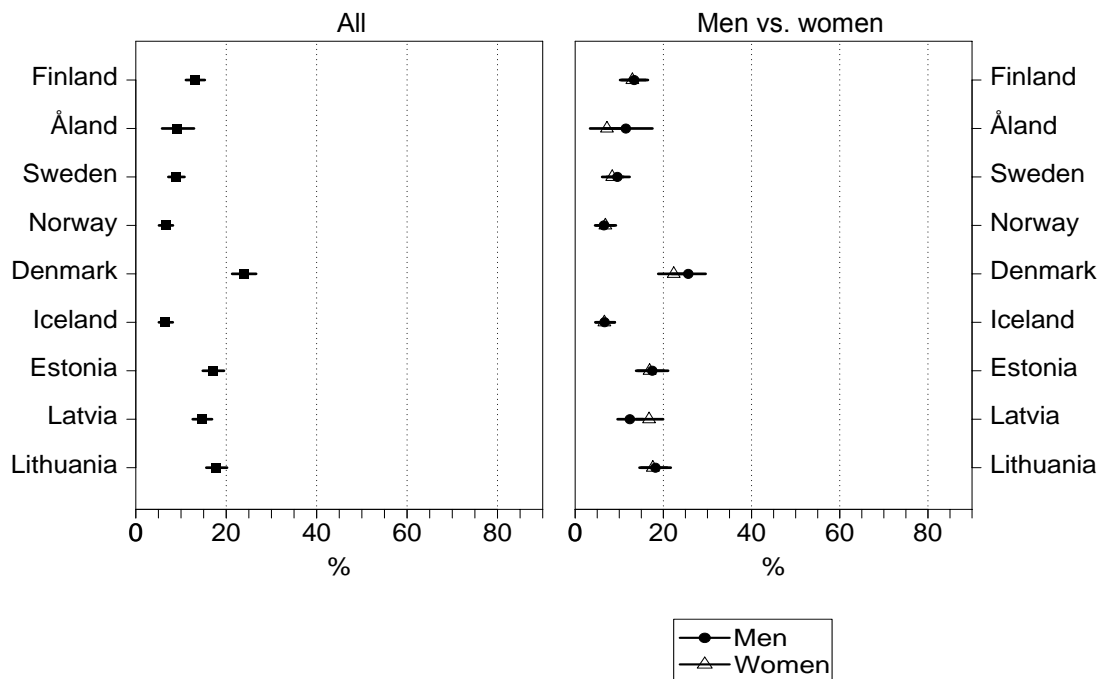


Figure 9. Proportion of high-consumers and low-consumers (mean and 95 % Bayesian confidence intervals) of fish and shellfish by country for all respondents and for men and women, respectively. NORBAGREEN 2002.

4.1.5 Consumption of bread

The proportion of subjects consuming 5 or more slices of bread a day, and the proportion consuming 7 or more slices a day, was biggest in Finland, Norway and the Baltic countries (Figs. 10 and 11). The proportion of men at each of these consumption levels was bigger than that of women. The proportion of low consumers of bread (subjects not consuming daily) was below 10% in every country, being biggest in Iceland and Estonia (Fig. 11).

Bread, subjects consuming ≥ 5 slices a day

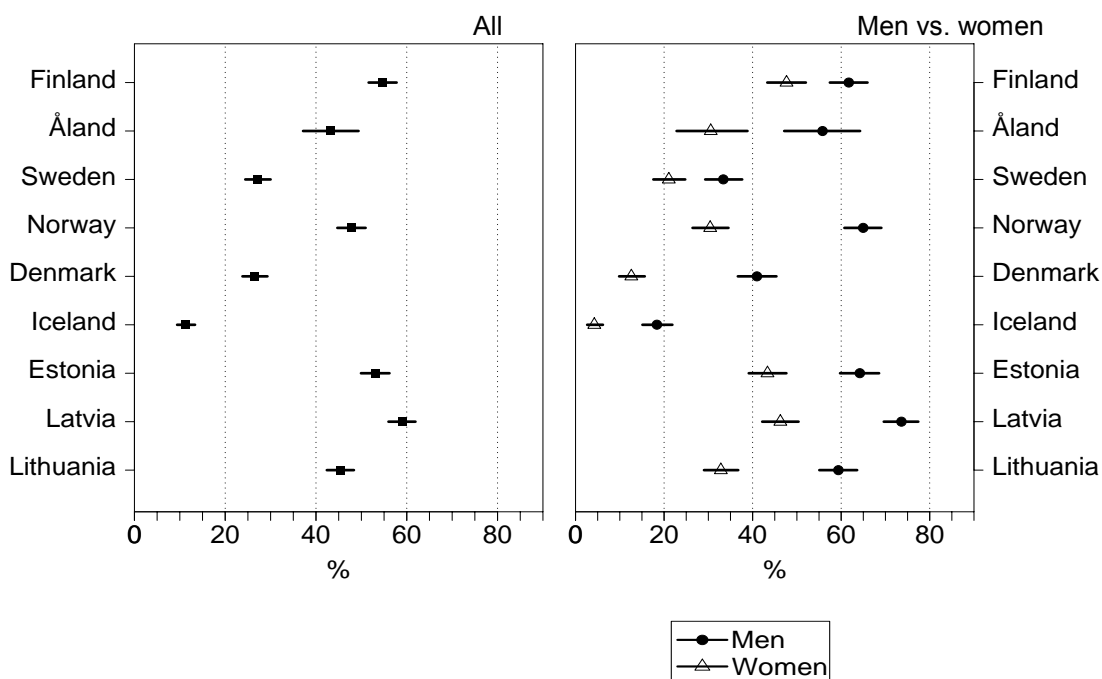
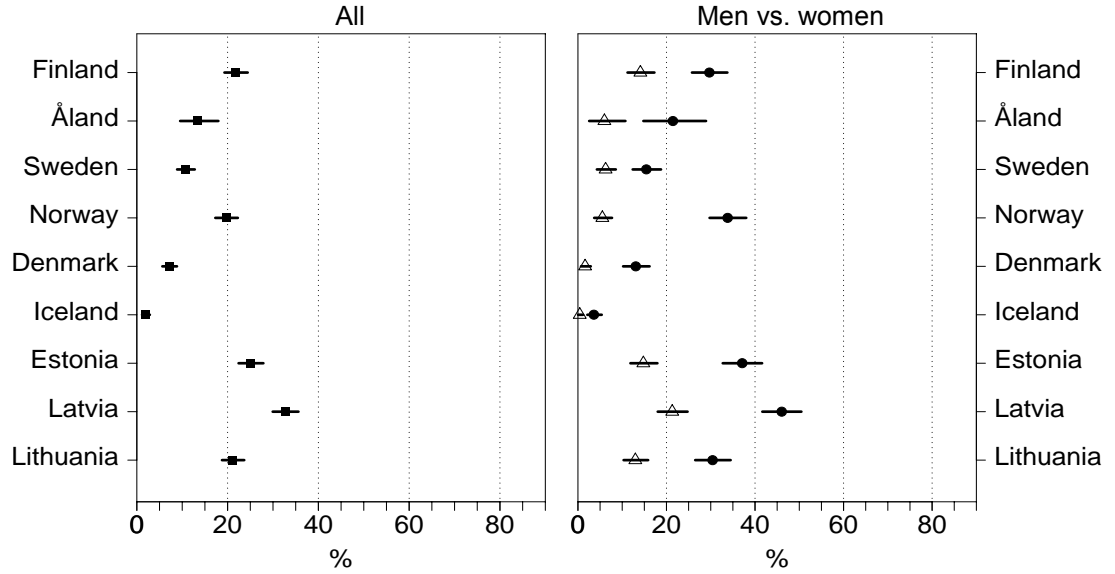


Figure 10. Proportion of subjects consuming ≥ 5 slices of bread a day (mean and 95% Bayesian confidence intervals) by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

Bread, subjects consuming ≥ 7 slices a day



Bread, low consumers (not daily)

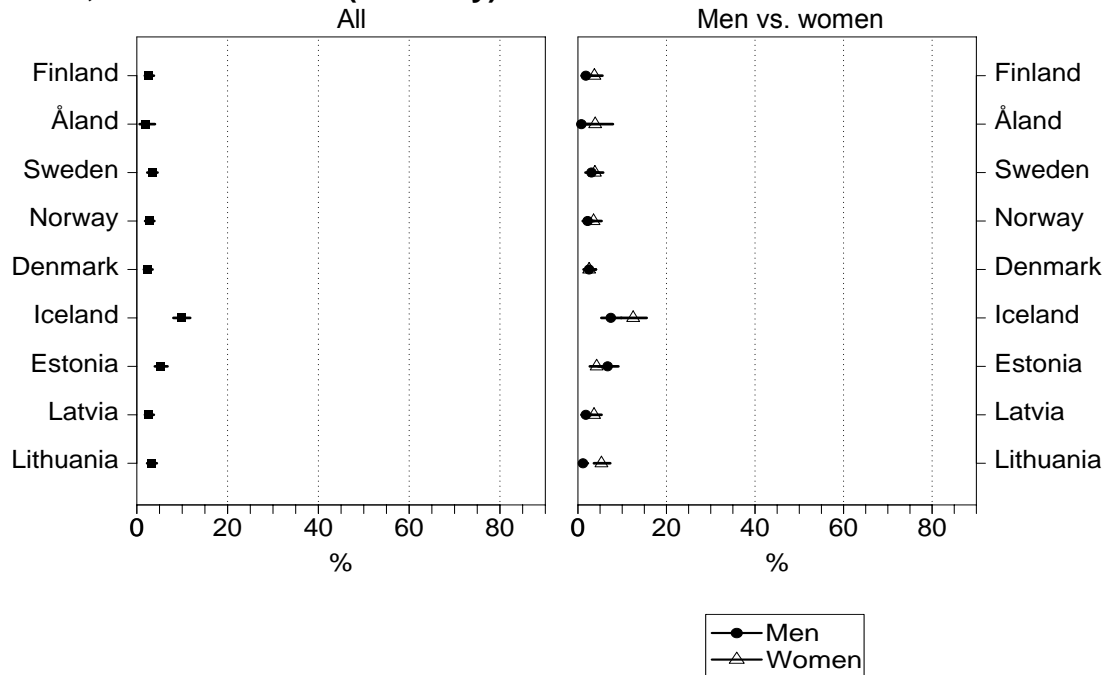


Figure 11. Proportion of subjects consuming ≥ 7 slices of bread a day and low consumers of bread (mean and 95 % Bayesian confidence intervals) by country for all respondents and for men and women, respectively. NORBAGREEN 2002.

Daily consumption of bread in the highest fibre category, so-called whole-grain bread, was common both in the Baltic countries and in the Nordic countries excluding Iceland (Fig. 12). The proportion of daily consumers was biggest in Denmark (89%) and Finland (86%), but the biggest proportions of subjects consuming 3 or more slices a day of the high fibre bread were in Finland, Sweden, Norway, Estonia and Latvia. The proportion of daily consumers of whole-grain bread did not differ between men and women, except in Iceland, where the proportion of women was bigger. When studying the consumption of 3 or more slices a day, the proportion of men was significantly bigger than that of women in the Baltic countries and Denmark.

The consumption of 3 or more slices a day of white bread (lowest fibre content) was more common in the Baltic countries than in the Nordic countries (Fig. 13). The proportion of men consuming more than 3 slices a day was bigger than that of women in the Baltic countries, Denmark and Sweden. Semi-whole-grain bread in quantities of 3 or more slices a day was consumed by the biggest proportion of subjects in Lithuania and Norway, and by the smallest in Sweden and Denmark.

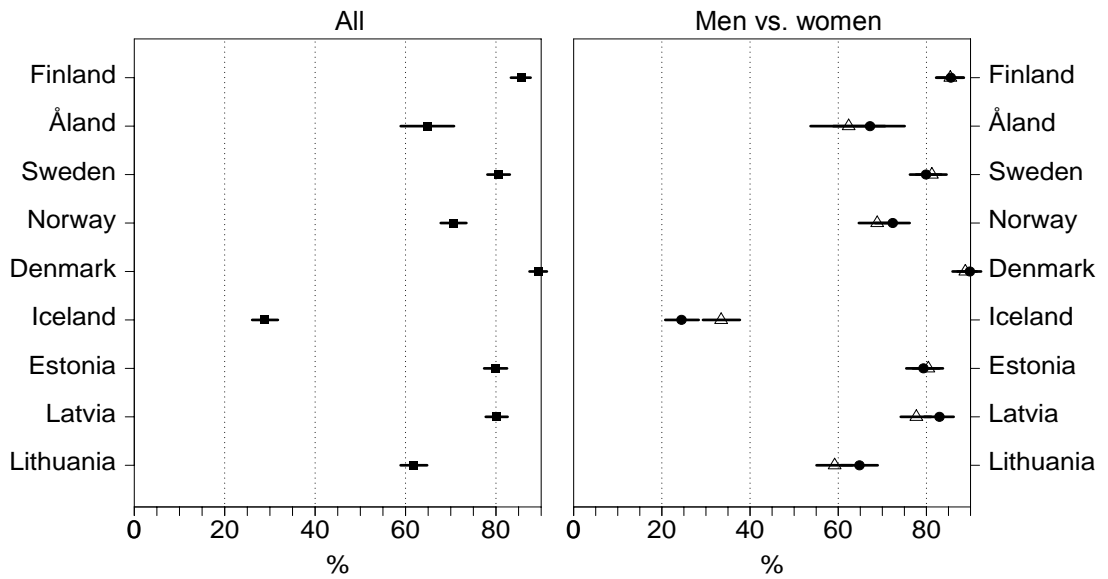
The order of popularity of breads with different fibre content in each country and the proportion of the sample consuming 5 or more slices per day are presented in Table 10.

Table 10. Popularity of breads with different fibre content* in each country and proportion of sample consuming ≥ 5 slices/day, (%)

Finland	Åland	Sweden	Norway	Denmark	Iceland	Estonia	Latvia	Lithuania
High 22	High 6	High 9	High 20	High 6	Semi 4	High 19	High 13	Low 17
Semi 4	Semi 4	Low 2	Semi 13	Low 2	High 1	Low 15	Low 13	Semi 14
Low 1	Low 1	Semi 1	Low 2	Semi 2	Low 1	Semi 6	Semi 5	High 12

*) High = high-fibre bread, > 6 g/100 g or 3 g/slice
 Semi = semi-high-fibre bread, 3-6 g/100 g or 1.5-3 g/slice
 Low = low-fibre bread, < 3 g/100 g or < 1.5 g/slice

Whole-grain bread (fibre content > 6 g / 100 g), daily consumers



Whole-grain bread (fibre content > 6 g/100 g), subjects consuming ≥ 3 slices a day

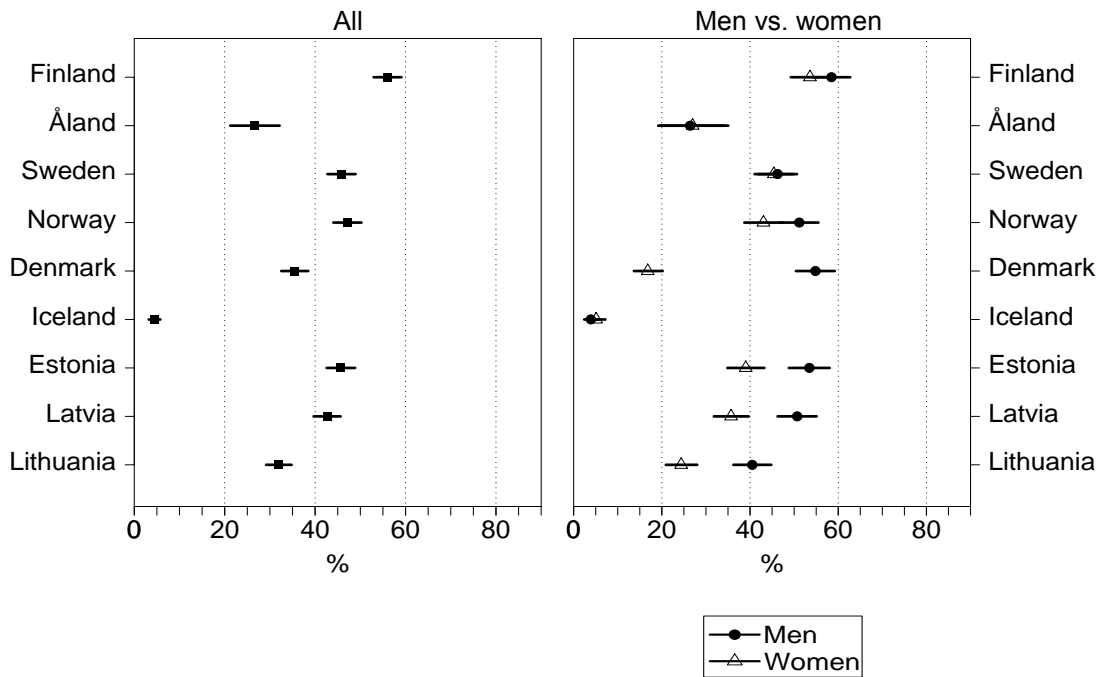
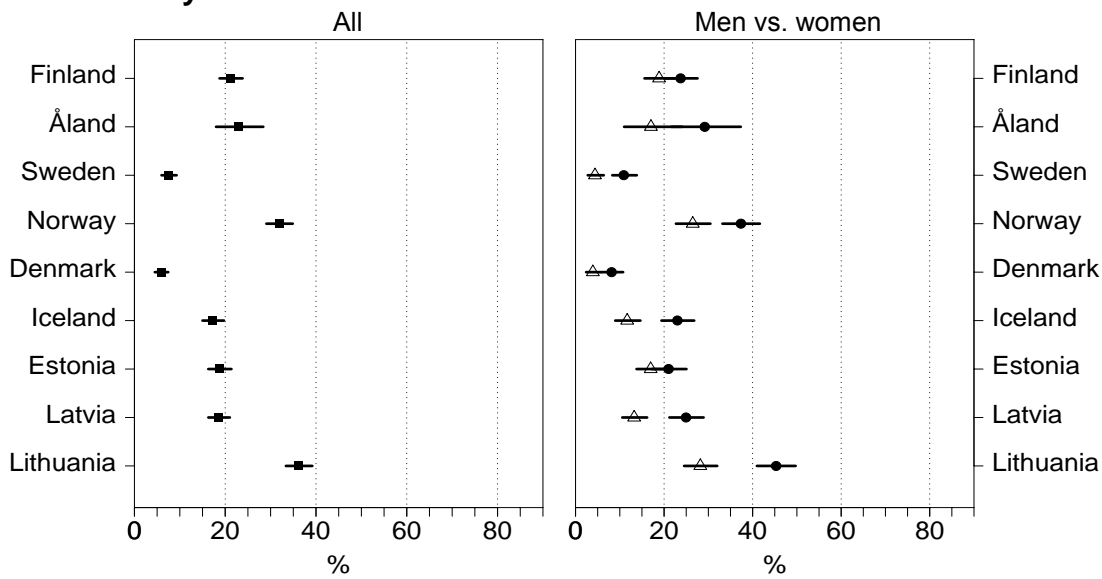


Figure 12. Proportion of daily consumers and subjects consuming ≥ 3 slices a day of whole-grain bread (fibre content > 6 g / 100 g or > 3 g / slice) (mean and 95% Bayesian confidence intervals) by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

Semi-whole-grain bread (fibre content 3-6 g / 100 g), subjects consuming \geq 3 slices a day



White bread (fibre content < 3 g / 100 g), subjects consuming \geq 3 slices a day

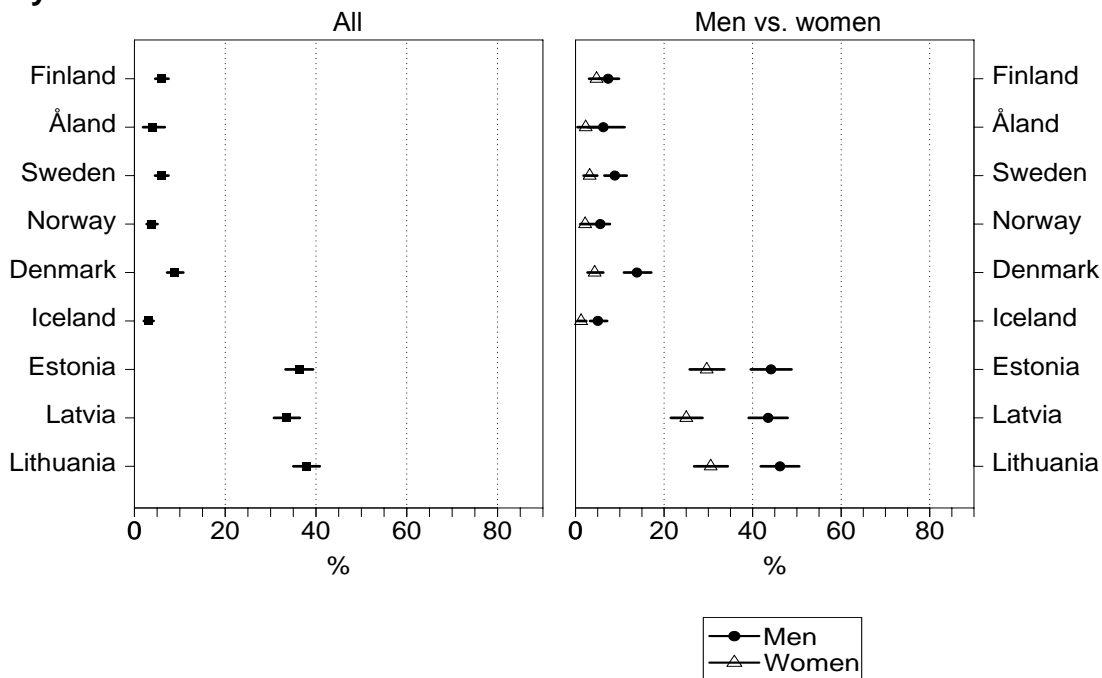


Figure 13. Proportion of subjects consuming \geq 3 slices a day of semi-whole-grain bread (fibre content 3-6 g / 100 g or 1.5-3 g / slice) and white bread (fibre content < 3 g / 100 g or < 1.5 g / slice) (mean and 95% Bayesian confidence intervals) by country, for all respondents and for men and women, respectively. NORBAGREEN 2002.

4.2 Results of the validation studies

The responses to the global questions on the total consumption of studied food groups showed lower estimates than the sums of the responses to questions about differently prepared forms. The summing of data for individual vegetables and fruits clearly overestimated total consumption.

The data from questions on total consumption showed significantly lower consumption compared to the reference method for vegetables and fruit in both Finland and Lithuania ($p < 0.05$), the two countries in which this validation test was carried out. The questionnaire data also showed lower consumption than the reference method for fish in the Finnish study and for potatoes in the Lithuanian study. The FFQ showed higher consumption, compared to the reference method, for bread in both countries and for potatoes in the Finnish study. In the Lithuanian study there was no difference in fish consumption between the methods. The sum consumption of differently prepared forms did not differ from the reference method ($p > 0.05$) in the case of vegetables (in the Lithuanian study when portions under 40 g were excluded from the data derived by the reference method) and fish in both validation studies; it also did not differ from the reference method in the case of potatoes in the Lithuanian study.

The Spearman correlation coefficient for the total consumption of vegetables (FFQ vs. the reference method) in the Lithuanian study, when portions < 40 g were excluded, was 0.55; in the Finnish study it was 0.51. Exclusion of small portions did not change the correlation in the Finnish study. Correlation for fruit consumption data was in the Finnish study 0.53 for the global question and 0.65 for the total consumption of differently prepared forms, and in the Lithuanian study 0.31 for the global question and 0.39 for the total consumption of differently prepared forms. In the Finnish study the correlation for potatoes was 0.23, for fish 0.32 and for bread 0.54; in the Lithuanian study it was 0.16 for potatoes, 0.25 for fish and 0.51 for bread.

There were no significant differences between FFQ1 and FFQ2 in the data for total consumption, except for total consumption of potatoes in Lithuania and total consumption of bread in Finland. Spearman correlation coefficients in the Finnish and

the Lithuanian study, respectively, were 0.71 / 0.60 for vegetables, 0.59 / 0.53 for fruit, 0.75 / 0.51 for fish, 0.59 / 0.65 for bread and 0.49 / 0.83 for potatoes.

5 Discussion

5.1 Quality and feasibility of the data collection

This study showed that it was possible to carry out the dietary survey in all eight countries using the same elicitation instrument. However, a number of critical points had to be addressed in the process from translating the FFQ into local languages and standardising it to its application in the data collection phase.

The original FFQ was in Swedish and was first translated into English. Thereafter it was translated into nine local languages (the eight target national languages and Russian) and then translated back into English to check the consistency of this step.

The method of data collection differed among the Nordic (CATI) and Baltic (PAPI) countries due to national considerations. In Sweden, Denmark, Estonia and Latvia, the questionnaire was included in ordinary omnibus surveys, whereas in other countries it was carried out as an ad hoc survey. The sampling technique used to obtain a representative sample differed as well. The effect of these different approaches on the comparability of the data is unknown.

The sampling design demanded that samples in all countries be representative of the population in regards to age, sex, and geographical area of residence. Additional questions characterising the subjects, e.g. questions about education, family situation, household size and income, were included in the questionnaire in order to provide opportunities for further analysis of sample profile and dietary aspects. The number of subjects that had to be contacted in order to reach the stipulated sample size of 1000 per country varied considerably among countries (Table 5). This might have influenced the representativeness of the final sample in comparison with the general population.

The composition of the final sample showed good agreement with the general population with respect to sex, age distribution and area of residence. However, in some countries the proportion of highly educated subjects was higher in the final sample

compared with the average population. For example, the proportion of university/graduate school educated subjects was 25% in the Swedish sample (in other countries the corresponding sample proportion was 8-21%), whereas that number is only 14% in the general Swedish population of the same age group (Statistics Sweden, 2003). This might have influenced the results, since high education is associated with higher consumption of fruit and vegetables, especially among men (Becker & Pearson, 2002).

In the Estonian sample the proportion of subjects with low income was bigger than in the average population (Statistical Office of Estonia). The consumption of vegetables in Estonia in this study was lower than in other studies (Pomerleau *et al.*, 2001; Puska *et al.*, 2003). The lower consumption might partly be explained by the bigger proportion of subjects with low income (Pomerleau *et al.*, 2000). The proportion of single households was lower in the final sample of most countries as compared to the general population.

The sampling design, fieldwork and data registration were commissioned to a commercial market research company. This turned out to be a necessity since no governmental or research organisation could take full responsibility for the survey fieldwork. However, the co-ordinating NORBAGREEN centre, in co-operation with participating centres, was responsible for all decisions regarding the final design and content of the questionnaire and basic study design issues. Close co-operation with the executing market research company proved essential.

5.2 Validity of the questionnaire

The FFQ was originally developed for monitoring the consumption of vegetables, potatoes and fruit (Johansson *et al.*, 1999b). In the NORBAGREEN project questions on fish and bread consumption were added since these foods were considered useful indicators of a healthy diet (Steingrímisdóttir *et al.*, 2002).

Potatoes are not considered a dietary indicator for health. However, potatoes were kept included in the FFQ for the following reasons: Monitoring potato consumption

separately, but in conjunction with the monitoring of vegetable consumption, is suggested to better understand the total consumption pattern of plant foods. Data on the consumption of potatoes provides relevant context for data on the consumption of vegetables because these foods are frequently substituted for one another, especially in the Baltic countries. Furthermore, in some countries existing dietary guidelines include potatoes in the group of vegetables; monitoring the consumption of potatoes as well as vegetables makes it easier to compare intake data to these national targets.

The validity of the extended FFQ was tested in two separate studies carried out in Finland and Lithuania. The results show that the external validity was good for vegetables, fruit and bread. The agreement for vegetables and fruit was good compared to the results of other validation studies (Andersen *et al.*, 1995; Osler & Heitmann, 1996; Bohlscheid-Thomas *et al.*, 1997; Ocke *et al.*, 1997; Field *et al.*, 1998).

The agreement for potatoes and fish was weak to moderate in both validation studies, in line with the results for potatoes in a Swedish validation study (Persson & Becker, 2002). Average consumption, times per day, was 0.6-0.7 for potatoes and 0.2 for fish. It is probable that the recorded periods in the reference methods used (2 x 3-day food records and 4 x 24-hr recalls) were not long enough to test the validity of questions about the consumption of fish.

The global questions on total consumption of studied foods tended to elicit lower estimates than the sums of estimates for differently prepared forms. This is in accordance with the Swedish validation study mentioned above (Persson & Becker, 2002). In the case of vegetables and fruit, the summed data for differently prepared forms corresponded better with the reference methods than the data from the global question on total consumption. By contrast, the sum of individual vegetables (19 kinds in the FFQ) and fruits (14 kinds) clearly overestimated total consumption. That was expected because it is known that asking several additive subquestions easily results in overestimation. The questions on individual vegetables, fruits and berries were included to obtain data on which types are most frequently consumed. However, as the validation study confirmed, the frequencies reported in response to these questions cannot be

added, since this would lead to an overestimate of total consumption. The FFQ also does not cover all sorts of other vegetables and fruits now available on the market.

Some individual vegetables such as cucumber, lettuce, onion, leek and garlic are often consumed in relatively small amounts in dishes or as part of a salad. Their frequency of consumption is high, therefore, while at the same time the actual amount consumed is less than a “normal” vegetable portion.

The reproducibility of the FFQ was good (Spearman correlation coefficient was in the Finnish study 0.49-0.75 depending on food and 0.51-0.83 in the Lithuanian study) when it was repeated in Lithuania and Finland after 6-8 months. Seasonal variation might affect the consumption data for vegetables, fruit and berries. To minimise this, subjects were asked to think about the entire preceding year when answering the questions. In the validation studies data were collected both in the spring and in the autumn. Good agreement was observed for the questions on total consumption of all foods, indicating that seasonal variation was of minor importance. For individual vegetables and fruits one would expect seasonal availability to have a stronger impact, as found by the earlier Swedish validation study (Persson & Becker, 2002).

5.3 Consumption of dietary indicator foods

The survey results indicate that there are differences between countries in the consumption of the indicator foods studied, especially between the Nordic and the Baltic countries. In some cases, e.g. vegetables, the frequency of consumption for the food group as a whole did not differ, but there were differences in the frequency of consumption of subtypes or in the popularity of methods of food preparation for items in the food group. The results of the NORBAGREEN study support previous findings that women tend to be more likely to adopt healthier eating habits and consume more fruit and vegetables (Puska *et al.*, 2003). In the following subsections the findings of the NORBAGREEN study are compared country by country to the results of earlier national dietary surveys.

Finland

The results of the NORBAGREEN main study are well in accordance with the national food frequency data obtained in the National FINRISK 2002 Study (Laatikainen *et al.*, 2003) and the Finnish NORBAGREEN validation study. However, the global questions (total consumption of a certain food group) of the NORBAGREEN main study seemed to underestimate the consumption of vegetables and fruit, although there was agreement in the case of potato and fish consumption (Fig. 14). A better agreement for vegetable and fruit consumption frequencies was obtained by comparing the sums of all preparation forms (Fig. 14).

The proportion of daily consumers of vegetables or fresh vegetables was slightly higher in the NORBAGREEN study compared to the results of the Health Behaviour and Health among the Finnish adult population. In that study the consumption of certain dietary indicator foods was established only for the week preceding data recording (Helakorpi *et al.*, 2002).

The most common vegetables--cucumbers, onions, tomatoes, carrots and lettuce--were the same in mainland Finland and the neighbouring study areas Åland, Sweden and Estonia, with some minor differences in the order of popularity.

The most commonly consumed fruits were also very similar in Finland and Åland. Finland and Åland were the only study areas where wild berries belonged to the top five fruits. Sweden, Norway and the Baltic countries showed wild berries in their list of the ten most popular fruits, but with a somewhat lower ranking. The only difference found in the list of most popular fruits between Finland and Åland was the greater pear consumption in Åland compared to mainland Finland.

Concerning bread consumption the NORBAGREEN study seemed to give an overestimate. This was seen in the Finnish validation study as well (data not shown) when its data were compared with the results of the FINRISK 2002 Study (Laatikainen *et al.*, 2003) (Fig. 15).

The average fish consumption frequency was shown to be a slight underestimate compared to the results of the Finnish validation study, but did not show any great differences when compared to the National FINRISK 2002 Study data (Laatikainen *et al.*, 2003). The same phenomenon of higher consumption of vegetables and fruit among women than men that was seen in the NORBAGREEN study in both mainland Finland and Åland had also been seen earlier in the National FINDIET 1997 and 2002 studies (Valsta *et al.*, 2000; Männistö *et al.*, 2003) and in the National FINRISK Study 2002 survey (Laatikainen *et al.*, 2003). No sex differences were found in the NORBAGREEN study in potato and fish consumption. By contrast, a higher potato consumption among men compared to women had been seen in Finland in the National FINRISK study 2002 survey (Laatikainen *et al.*, 2003). The higher daily consumption of bread by men compared to women had also been seen in the national FINRISK Study (Laatikainen *et al.*, 2003) and in national dietary studies (Valsta *et al.*, 2000; Männistö *et al.*, 2003), but this difference disappears when the results are adjusted by energy intake.

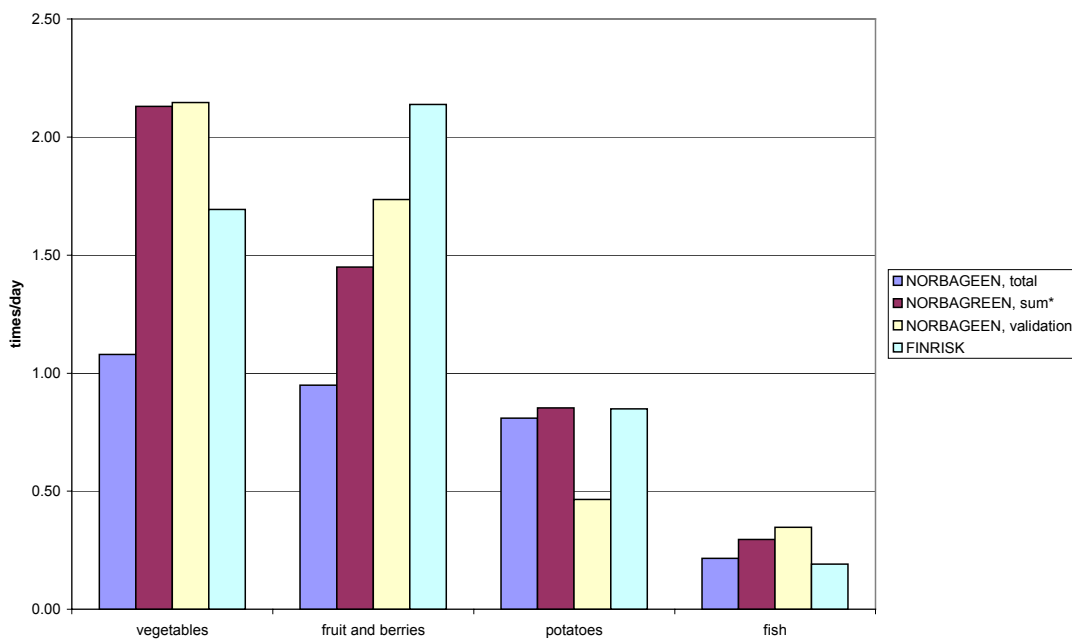


Figure 14. Consumption frequencies for vegetables, fruit and berries, potatoes and fish in Finland according to the NORBAGREEN study, the Finnish NORBAGREEN validation study and the National FINRISK Study 2002 survey (Laatikainen *et al.*, 2003). *sum = sum consumption of different preparation forms

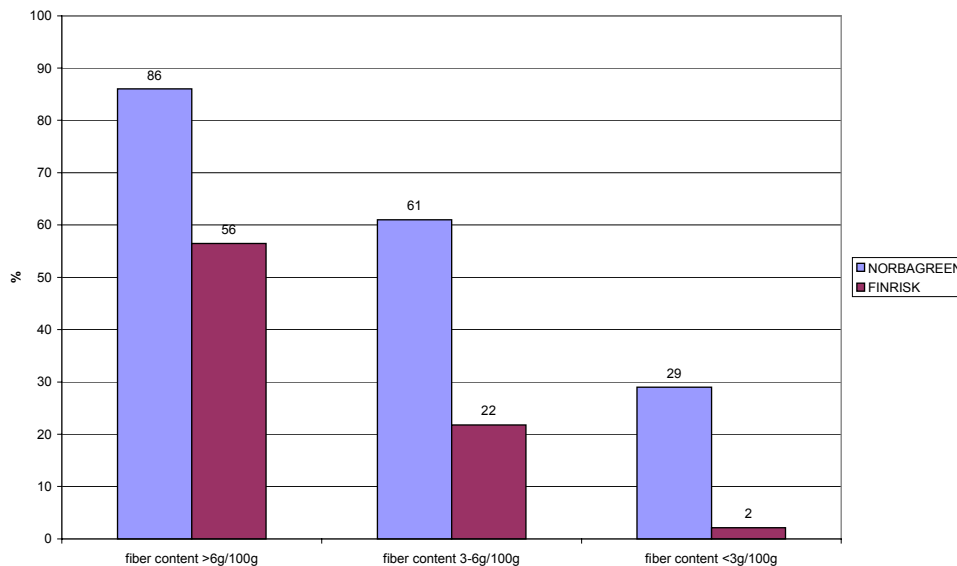


Figure 15. Percentages of Finnish respondents consuming breads of different fibre content once a day or more according to the NORBAGREEN study and the National FINRISK Study 2002 survey (Laatikainen *et al.*, 2003).

Sweden

The results from the NORBAGREEN study show several features for fruit and vegetables that are similar to a recent Swedish national dietary survey, “Riksmaten”, carried out in 1997-98 (Becker & Pearson, 2002). These features include higher consumption of fruit and vegetables among women than among men. However, the total consumption frequencies, especially for vegetables, are lower than in Riksmaten. The agreement is better for the sums of all preparation forms (Fig. 16). This is also in line with the Swedish validation study (Persson & Becker, 2002). The consumption frequency for “vegetables on bread” is fairly high in NORBAGREEN, but these vegetables are usually consumed in small amounts, less than ordinary portions. The most frequently consumed vegetables, fruits and berries were about the same in NORBAGREEN and Riksmaten, with the exception of onions, which in Riksmaten are found mainly in prepared dishes and thus are not recorded as a separate food item.

According to both NORBAGREEN and Riksmaten women and men eat potatoes equally often. In Riksmaten men ate more potatoes, expressed in grams per day, than

women did, as a result of larger portion sizes. For fish the consumption frequency was about twice as high in Riksmaten as in NORBAGREEN.

For bread there is relatively good agreement for the number of slices eaten per day, but the distribution among the different bread types differs. In NORBAGREEN white bread is consumed less frequently and rye crisp more frequently than in Riksmaten. This may partly be due to difficulties among respondents in identifying and classifying different bread types.

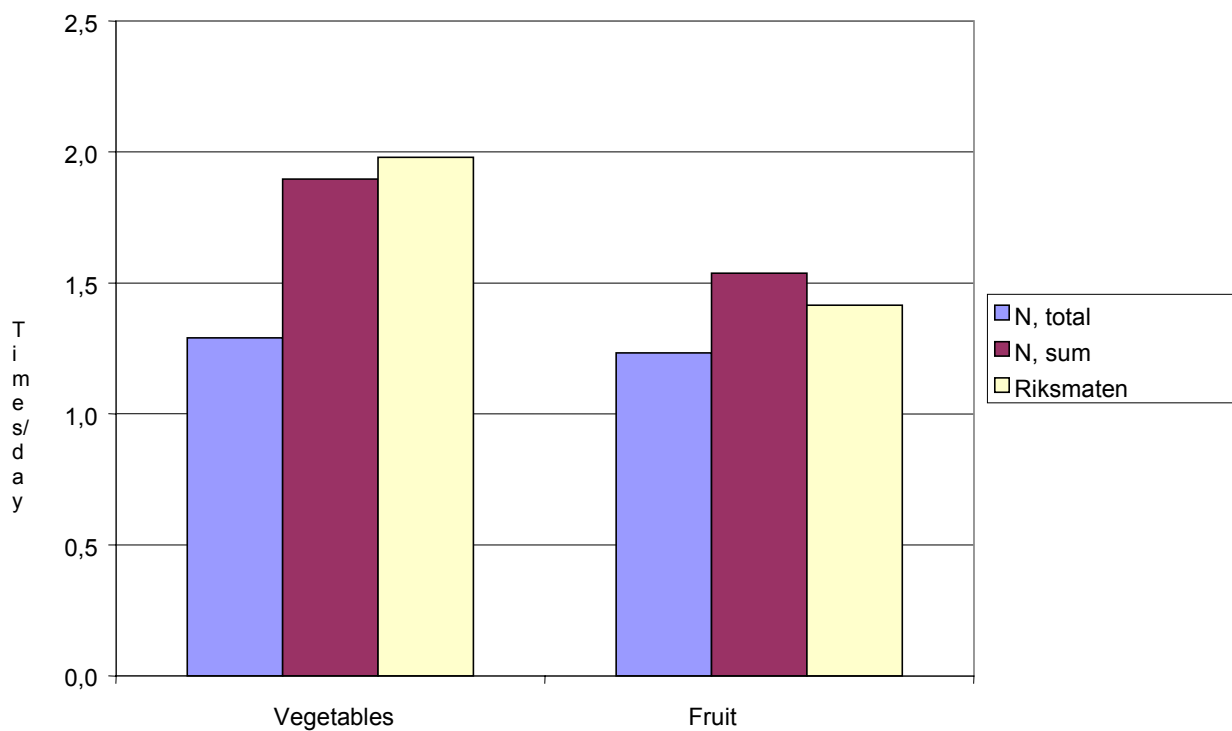


Figure 16. Consumption frequencies for vegetables and fruit in Sweden according to NORBAGREEN (N) and Riksmaten.

Norway

Overall the consumption frequencies measured in the Norwegian sample of NORBAGREEN are in accordance with data from Norwegian market surveys, national dietary surveys and per capita figures.

The mean frequency for consumption of potatoes, vegetables and fruit measured by the global question in the NORBAGREEN survey was at the same level as the frequency found by other surveys using similar questions in nationwide random samples among adults during 1996-2000 (Scanfact, 1999; MMI, 2000). The sum of preparation forms corresponded well with the sum of consumption frequencies probed by several questions for each of the three food groups in the national dietary survey among adults in 1997. NORBAGREEN showed that Norwegian women had fruit and vegetables more often than men. This is in accordance with findings from the national dietary survey.

In NORBAGREEN the four most frequently consumed vegetables were cucumbers, onions, tomatoes and carrots. The four most frequently consumed fruits (or berries) were apples, citrus fruits, bananas and pears. According to Norwegian per capita statistics the most-consumed vegetables in 2001 were, in descending order, carrots, cabbage, tomatoes, onions, rutabaga and cucumbers, and the most-consumed fruits (or berries) were apples, bananas, citrus fruits and pears.

Fish was eaten for dinner 1.6 times per week and as a side dish or on top of bread 1.5 times per week in NORBAGREEN. Small differences in frequency of fish consumption were found between genders. This was also found in the national dietary survey. However, the frequency for fish consumption was higher in the dietary survey than in NORBAGREEN. This may have been due to the inclusion of substantially more questions about different fish dishes and side dishes in the dietary survey.

The average bread consumption was 4.7 slices per day (3.9 for women and 5.5 for men). This is lower than the average 5.9 slices per day measured in the national dietary survey (5 for women and 6.8 for men). The use of 7 or more slices as the highest frequency

category in the NORBAGREEN questionnaire, vs. 12 or more slices in the dietary survey, may have caused this difference.

Denmark

The results from the Norbagreen study regarding fruit and vegetable consumption show several similarities with a recent Danish national dietary survey, “Danskernes kostvaner”, which was carried out in 1995 and 2000/01 (Andersen NL, 1996; Fagt *et al.*, 2002). These include higher consumption of fruit and vegetables among women than among men.

Iceland

NORBAGREEN results confirm previous data, both from national dietary surveys and from consumption statistics, showing low consumption of vegetables in Iceland. Iceland ranks consistently lowest or next-to-lowest among the studied countries in this respect. It does so despite a considerable increase in vegetable consumption according to the last national nutrition survey conducted in Iceland (Icelandic Nutrition Council, 2003). NORBAGREEN results are also consistent with the national survey in showing a lack of sex difference with respect to vegetable consumption in Iceland, unlike many other countries, where women show higher consumption than men. Interestingly, the mean total frequency of consumption according to NORBAGREEN, both for vegetables and for fruit, is in full agreement with that seen in the last national survey in Iceland, in which total frequency was assessed in the same manner as in NORBAGREEN (Icelandic Nutrition Council, 2003). By contrast, the 24-hr recall method used in the main part of the national nutrition survey does not lend itself easily to quantitative comparison with the NORBAGREEN frequency method.

Fruit consumption in Iceland similarly ranks at the bottom of the Nordic countries in NORBAGREEN, which is consistent with results from dietary surveys and consumption statistics. FAO data for fruit consumption in Iceland constitute an aberration that is inconsistent with all other available data. The sex difference in fruit

consumption is similar in NORBAGREEN as in the recent national survey, in that women consume more fruit than men.

NORBAGREEN results regarding potatoes seem contradictory to both dietary survey data and consumption statistics, as Iceland ranks relatively high in frequency of consumption compared with other countries according to NORBAGREEN, whereas the national dietary survey shows rather small potato consumption compared with other countries. This seeming contradiction can be explained by traditionally smaller potato portions but greater frequency of potato consumption in Iceland, where two hot meals a day are relatively common. Men report a somewhat higher frequency of consumption than women, which is in agreement with the results of the dietary survey.

Fish consumption ranks high in Iceland according to NORBAGREEN, which is in agreement with dietary surveys and consumption statistics. However, according to the last national survey, fish consumption has decreased dramatically in Iceland recently, and this fact is confirmed in NORBAGREEN, as Iceland now ranks second behind Norway although it used to have the highest consumption, by every measure. Mean frequency of fish consumption, times per day, is 0,3 both in NORBAGREEN and in the 2002 nutrition survey (Icelandic Nutrition Council, 2003).

NORBAGREEN data with respect to bread consumption are not in total agreement with the most recent national dietary survey. According to NORBAGREEN, the frequency of bread consumption is far lower in Iceland than in any of the other Nordic or Baltic countries, whereas the national survey shows that the traditionally low quantity of bread consumed has increased in Iceland and now ranks between Denmark and Sweden. This discrepancy can perhaps in part be explained by the exceptionally large slices of common sandwich bread types in Iceland (45g), which may contrast with a relatively lesser frequency of bread consumption.

The Baltic countries

In the Baltic countries an FFQ method has been used as part of Health Behaviour Surveys carried out within the Finbalt Health Monitor project in 2000 (Prättälä *et al.*, 1999) and as part of national dietary surveys in 1997. According to the Health Behaviour Surveys (Grabauskas *et al.*, 2001; Kasmel *et al.*, 2001; Pudule *et al.*, 2001) the differences between Estonia, Latvia and Lithuania in the frequency of vegetable consumption during the week preceding the survey were small. However, the proportion of men and women eating fresh vegetables on at least six days per week was the lowest in Estonia (17,8% compared to 19,2% in Lithuania and 21,8% in Latvia). The consumption of fresh fruit was lower in Lithuania compared to Latvia and Estonia: fruit had been eaten almost every day of the preceding week by 12,9% of Lithuanians, 18,1% of Latvians and 19,5% of Estonians. Women consumed vegetables and fruits more often than men in all countries. The proportion of daily consumers of boiled potatoes was lower than in the NORBAGREEN study (in Estonia 9,7%, in Latvia 12,1% and in Lithuania 18%). No differences in consumption of potatoes between men and women were found. Lithuanians consumed fish more frequently than Latvians and Estonians. The proportion of persons eating fish at least once a week was 77,3% in Lithuania, 69,6% in Latvia and 67,4% in Estonia. The consumption of whole-grain bread was more popular in Latvia than in Estonia and Lithuania. White bread was used more often in Latvia and Lithuania than in Estonia. The proportion of high consumers of bread was the highest in Latvia; however, it was lower than in the NORBAGREEN data. In all countries men consumed more bread than women.

In national dietary surveys, carried out in 1997, the weekly consumption of all vegetables over 6 days per week was 41,6% for Estonian, 57,2% for Latvian and 74,8% for Lithuanian men and similarly 53,4% for Estonian, 62,5% for Latvian and 80,2% for Lithuanian women (Pomerleau *et al.*, 2000). The higher consumption of vegetables in Latvia and Lithuania and across countries in women was also observed in the NORBAGREEN project. In the 1997 survey, Lithuanians and Latvians were reported to be more dependent on locally grown foods generally, which explains the relatively higher consumption in these countries.

In the national dietary surveys the frequency of eating vegetables (not including potatoes) was investigated. The FINBALT survey has data on the frequency of consumption of vegetables, fruit and fish during the week preceding record-taking; it is therefore not representative of year-round consumption. As mentioned, Baltic countries have high consumption of locally grown fruits, vegetables and potatoes, leading to considerable seasonal variations.

All of the five most commonly consumed vegetables in the Baltic countries are typically locally grown; therefore the annual crop yield or time of the survey might have a slight influence on results. However, the finding that citrus fruits and banana are the second and third commonly consumed fruits in these countries supports previous observations of a trend towards higher consumption of commercially available, non-local fruits (Estonian Nutrition Society, 2002). This trend merits further analysis by comparing consumption of foods together with agricultural data.

5.4 Consumption compared to guidelines

A secondary aim of the project was to compare the results of the questionnaire with current dietary guidelines. In this context it is problematic that basic recommendations for fruit and vegetables usually refer to amounts per day, rather than frequencies. Frequency-based guidelines are used in parallel with quantitative recommendations in some, but not all, countries. The FFQ gives some examples of portions for fruit and berries, but not for vegetables. The frequency data it provides can therefore not be directly translated into amounts; however, the total consumption frequency, or the proportion of the respondents below or above a certain consumption frequency, can be used as a relative measure. This study showed that only less than 10% of the subjects fulfilled the guideline of eating vegetables and fruit five times (portions) a day. The only group studied that had a proportion of over 10% consuming vegetables and fruit five times a day were Swedish women, of whom about 12.5 % did so. The only countries where the proportion of women consuming at least five portions of vegetables and fruit a day was larger than the proportion of men doing so were Sweden, Denmark and Finland.

In spite of the larger energy need of men, the consumption frequency of vegetables, fruit and fish did not seem to be higher among men than women. When fish consumption twice a week or more was considered as a guideline for fish consumption, approximately 25-65 % of subjects in different countries in this study reached that consumption frequency. The proportion was under 40% in mainland Finland, Denmark, Estonia and Lithuania, and exceeded 60% only in Norway and Iceland. No sex difference was found in this respect.

Higher bread consumption of men compared to women is generally related to the larger energy need of men. When the data were adjusted for known average energy needs, there were no differences in the proportion of high bread consumers between sexes, except in Finland, where the proportion of high consumers among women was bigger. When bread consumption of 7 or more slices a day was considered as a guideline for men and consumption of 5 or more slices a day for women, the proportion of subjects reaching the guideline varied between 3% (Iceland) and about 50% (Latvia). The only

country where a sex difference was found was Finland: close to 50% of women but only about 30% of men consumed high amounts of bread.

None of the participating countries show consumption of dietary indicator foods according to the national and international guidelines. However, consumption of dietary indicator foods is higher in the Nordic countries, where there have been extended promotion campaigns, and lower in the Baltic countries, where promotional activities have not been as extensive and long-lasting. Cooking methods as well were observed to be healthier in the Nordic countries, whose residents consume more fresh fruit and vegetables, more fresh juice and fewer fried potatoes.

6 Conclusions

The development of the NORBAGREEN questionnaire (FFQ) has, for the first time, made it possible to obtain comparable data on the consumption frequencies of vegetables, potatoes, fruit, bread and fish in the Nordic and the Baltic countries.

According to the validation studies carried out in Lithuania and Finland, the FFQ developed for this project seems to give a fair picture of group mean consumption of the indicator foods studied. The global questions on total consumption tended to give an underestimate of vegetable and fruit consumption and an overestimate of bread consumption compared to the reference method. In addition, in Finland the global fish question seemed to underestimate total fish consumption. The FFQ can be used to rank subjects according to vegetable, fruit and bread consumption. The validity of the fish data was somewhat lower and the validity for of the data for potato was poor. According to the two validation studies the reproducibility was shown to be good for most food groups.

The implementation of this comparative survey involved the challenge of collecting data with exactly the same method in eight Nordic and Baltic countries. Despite this challenge, the use of existing networks of market research companies proved feasible, although special efforts were required to maintain the comparability of the method throughout the process in all participating countries. Shortening the FFQ so that it contains only the key questions--those on total consumption of each food group and on consumption according to different preparation forms--would make data collection even more feasible, not least from a practical and financial point of view.

There were clear quantitative and qualitative differences between the Nordic and Baltic countries in vegetable, fruit, potato, fish and bread consumption. It was seen, especially for fruit and vegetables, that although the consumption frequency may be similar, the most important types of fruits and vegetables used in these two groups of countries are not the same, due to differences in food supply and cultural aspects. Obvious differences in consumption frequency between men and women were fairly similarly to those seen in national dietary surveys of most of the participating countries.

Large proportions of the Nordic and Baltic populations do not meet the official or non-official guidelines for consumption of fruit and vegetables, bread and fish. The NORBAGREEN study clearly indicates that all participating countries are still far from reaching the “Five a Day” target. The results of this study constitute good baseline data for broader educational campaigns and allow the evaluation of future initiatives with similar methodology in these countries.

There is a great need to promote consumption of these dietary indicators of health. The NORBAGREEN questionnaire is a useful tool for measuring fruit and vegetable, bread and fish consumption. Although the importance of potato consumption for health is still to be evaluated, monitoring of potato consumption separately but in conjunction with the monitoring of vegetable consumption is suggested to better understand the total consumption pattern of plant foods.

The validation study carried out as part of this project suggests that the questions measuring potato and fish consumption need to be developed further to increase the validity of the resulting data in the Nordic and Baltic countries. Differences found in the validation study between a Nordic country (Finland) and a Baltic country (Lithuania) call for further evaluation. Furthermore, validation of the FFQ in one of the western Nordic countries is recommended.

In the future the NORBAGREEN FFQ can be used to follow changes in vegetable, potato, fruit, bread and fish consumption in the Nordic and Baltic countries. A follow-up study every 3-5 years would make it possible to monitor relevant trends in these countries. It is proposed, however, that the FFQ be simplified, to make data collection more feasible. The experience of this survey indicates that the same method may be expanded to other countries as well, but that it would first need to be tested and validated in such countries.

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Appendices

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Frequency of eating vegetables and roots

1. Vegetables and roots, all types, total
2. Fresh vegetables or roots, salad, grated fresh vegetables or roots
3. Vegetables or roots on bread
4. Cooked, canned or steamed vegetables or roots
5. Fried or wok vegetables or roots
6. Vegetable or root dishes
7. Vegetable or root juice

Frequency of eating individual vegetables and roots

8. Carrot
9. Rutabaga, turnip, parsnip, root parsley
10. Red beet
11. Cabbage
12. Cauliflower
13. Broccoli, brussel sprouts
14. Green salad
15. Tomato
16. Cucumber
17. Sweet pepper
18. Spinach
19. Avocado
20. Radish, black radish
21. Pumpkin, marrow, aubergine
22. Rhubarb
23. Onion, leek, garlic
24. Peas, corn, mixed vegetables
25. Foods prepared of dried peas, beans and lentils
26. Mushrooms

Frequency of eating potatoes

27. Potatoes, all types, total
28. Boiled or baked potatoes
29. Mashed potatoes
30. Fried potatoes, French fries

Frequency of eating fruit and berries

- 31. Fruit and berries of all sorts, total
- 32. Fresh or frozen fruit/berries, mashed fruit/berries
- 33. Canned fruit/berries, cooked fruit/berries
- 34. Fruit juice/berry juice
- 35. Dried fruit/berries

Frequency of eating individual fruits and berries

- 36. Citrus fruits
- 37. Banana
- 38. Apple
- 39. Pear
- 40. Peach, nectarine, apricot
- 41. Kiwi
- 42. Melon
- 43. Plums, cherries
- 44. Grapes
- 45. Pineapple
- 46. Strawberries
- 47. Raspberries, blackberries
- 48. Currants, gooseberries
- 49. Blueberries, lingonberries, cranberries
- 50. Cloudberry
- 51. Mango, papaya

Frequency of eating fish and shellfish

- 52. Fish/shellfish, all types, total
- 53. Fish/shellfish as a main dish
- 54. Fish/shellfish as a side dish, on a sandwich or in salad

Consumption of bread

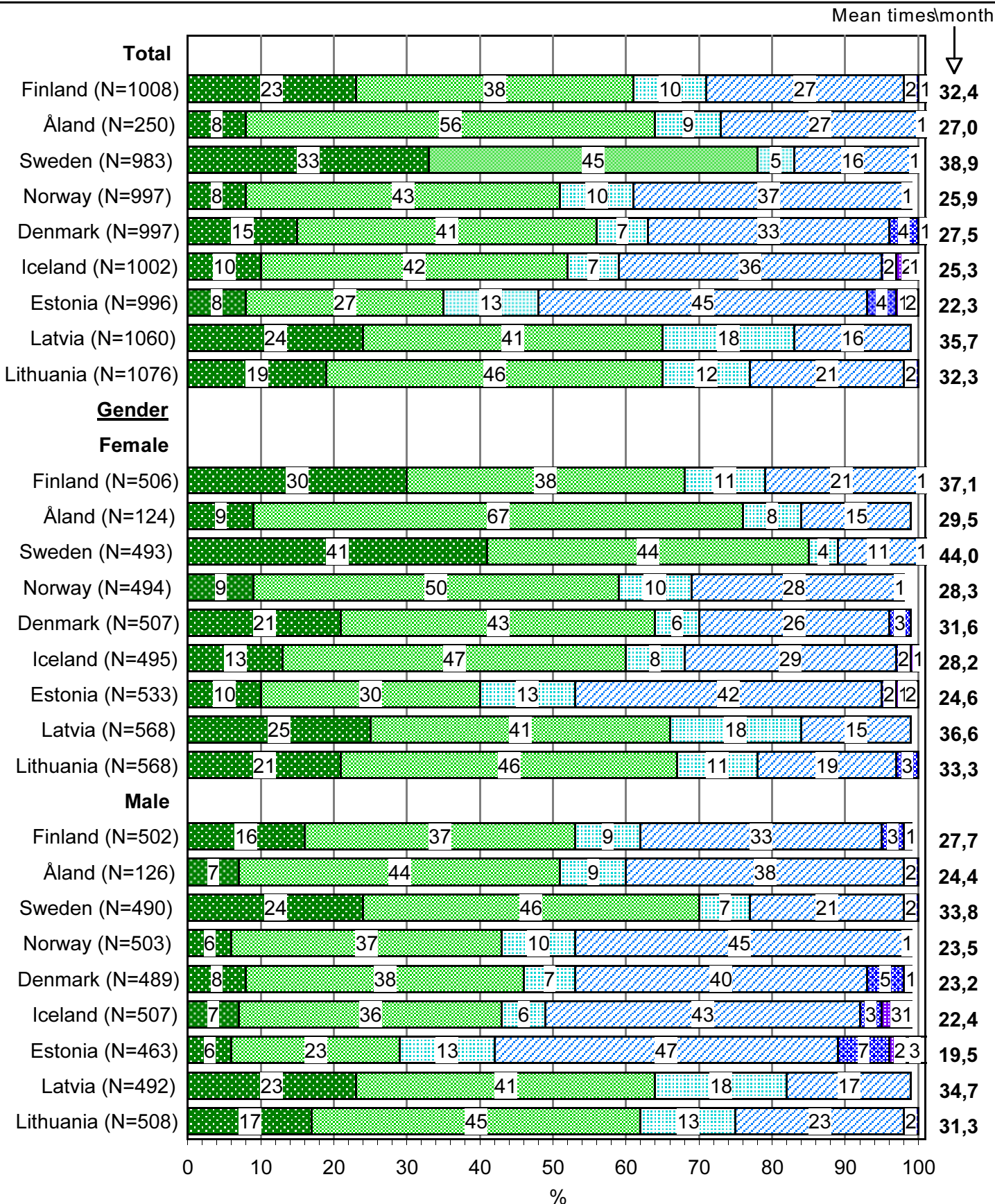
- 55. All types, total
- 56. National breads: fiber content > about 6 g/100 g
- 57. National breads: fiber content about 3-6 g/100 g
- 58. National breads: fiber content < about 3 g/100 g

Frequency of eating vegetables and roots

VEGETABLES AND ROOTS, ALL TYPES TOTAL

A Figure 1

N=total weighted

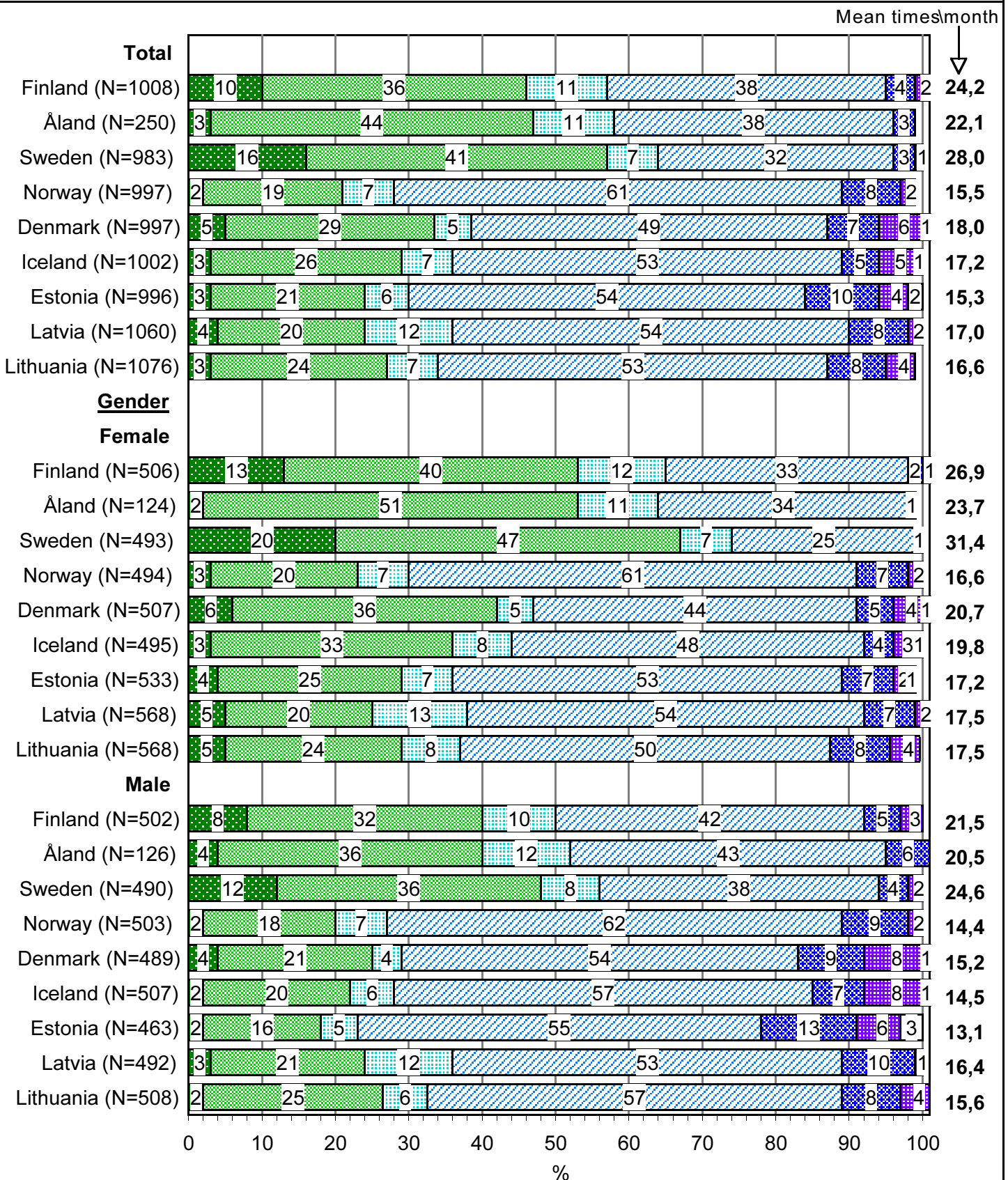


Frequency of eating vegetables and roots

FRESH VEGETABLES OR ROOTS, SALAD, GRATED FRESH VEGETABLES OR ROOTS

A Figure 2

N=total weighted



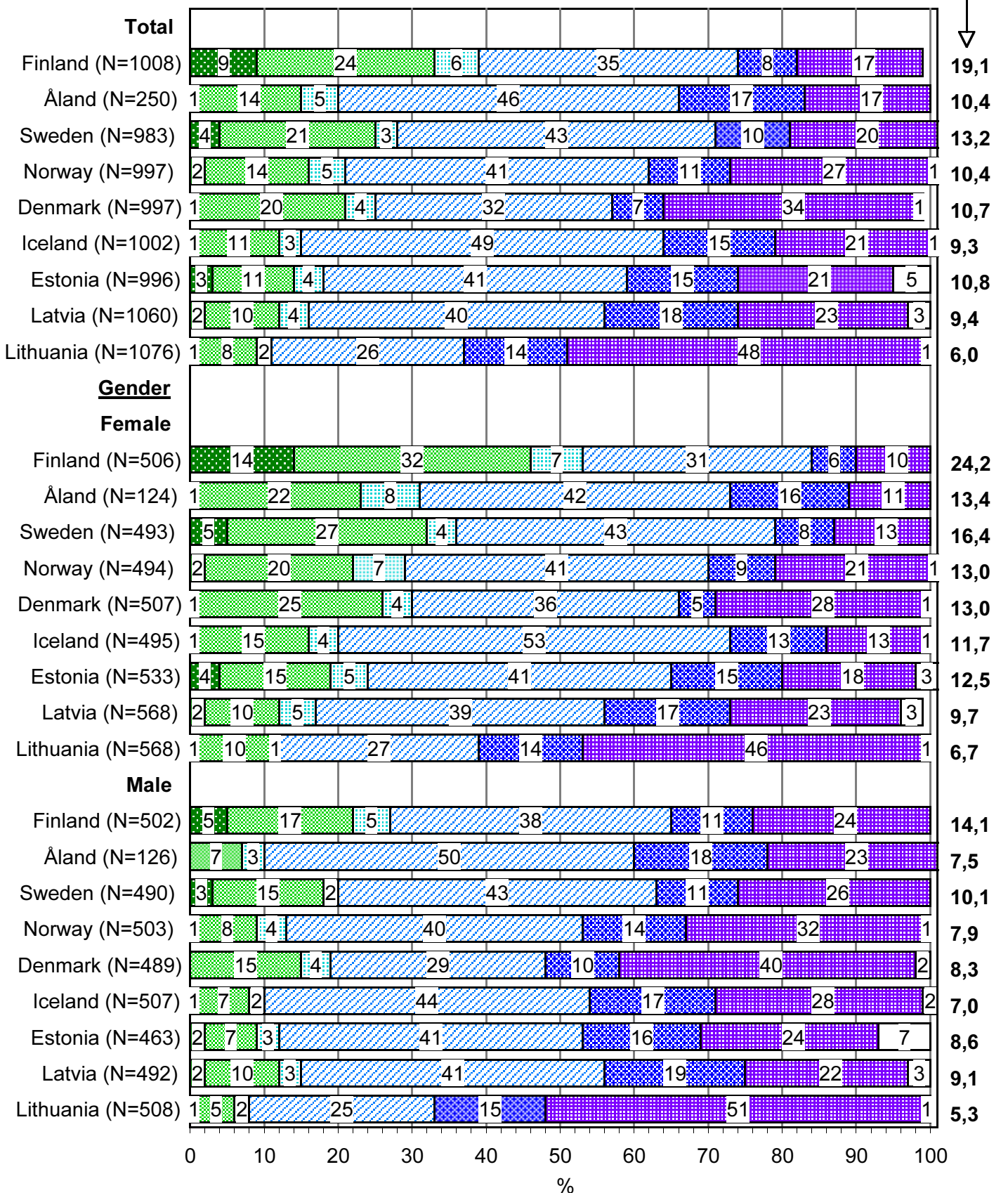
Frequency of eating vegetables and roots VEGETABLES OR ROOTS ON BREAD

A Figure 3

N=total weighted



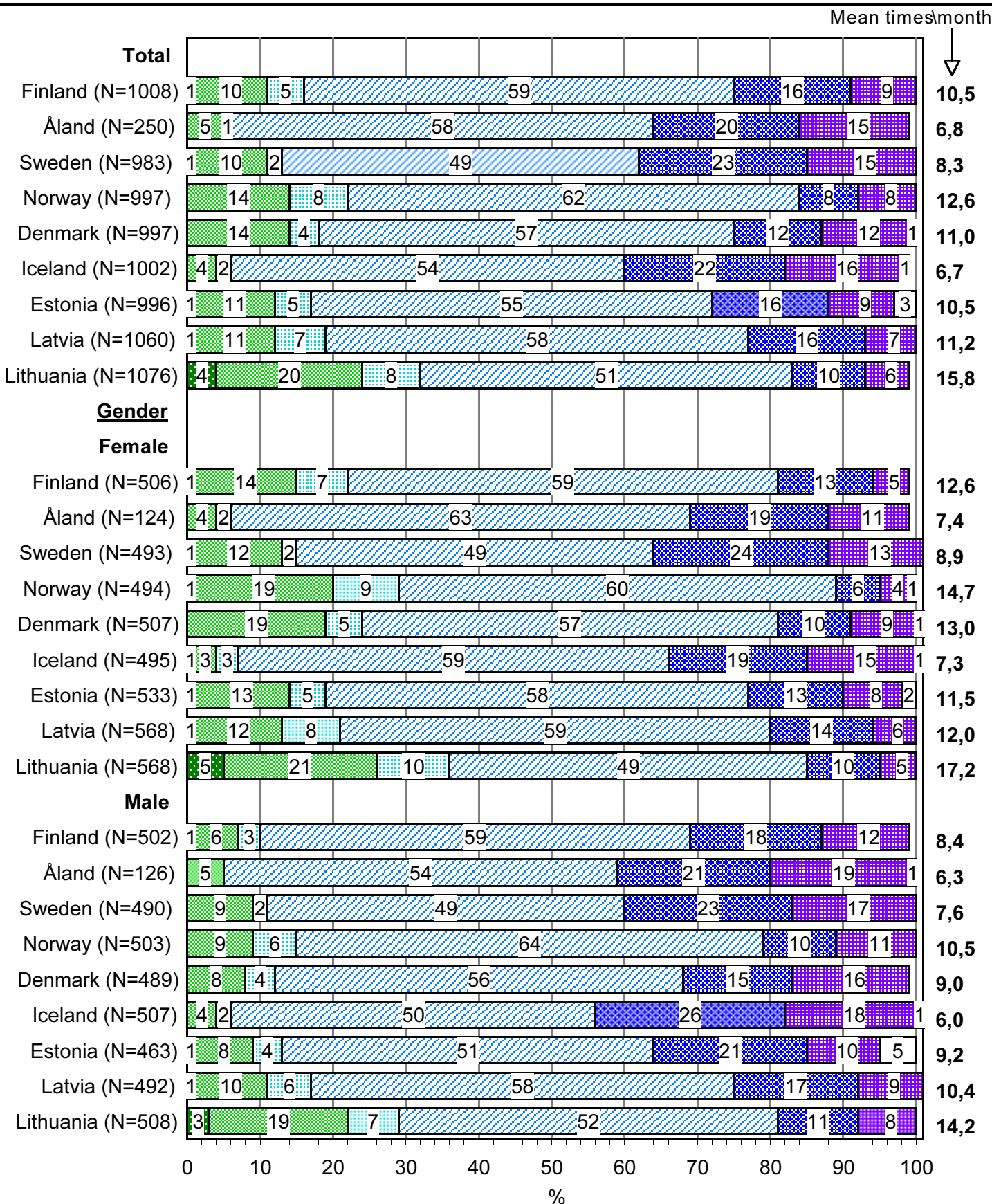
Mean times/month



Frequency of eating vegetables and roots COOKED, CANNED OR STEAMED VEGETABLES OR ROOTS

A Figure 4

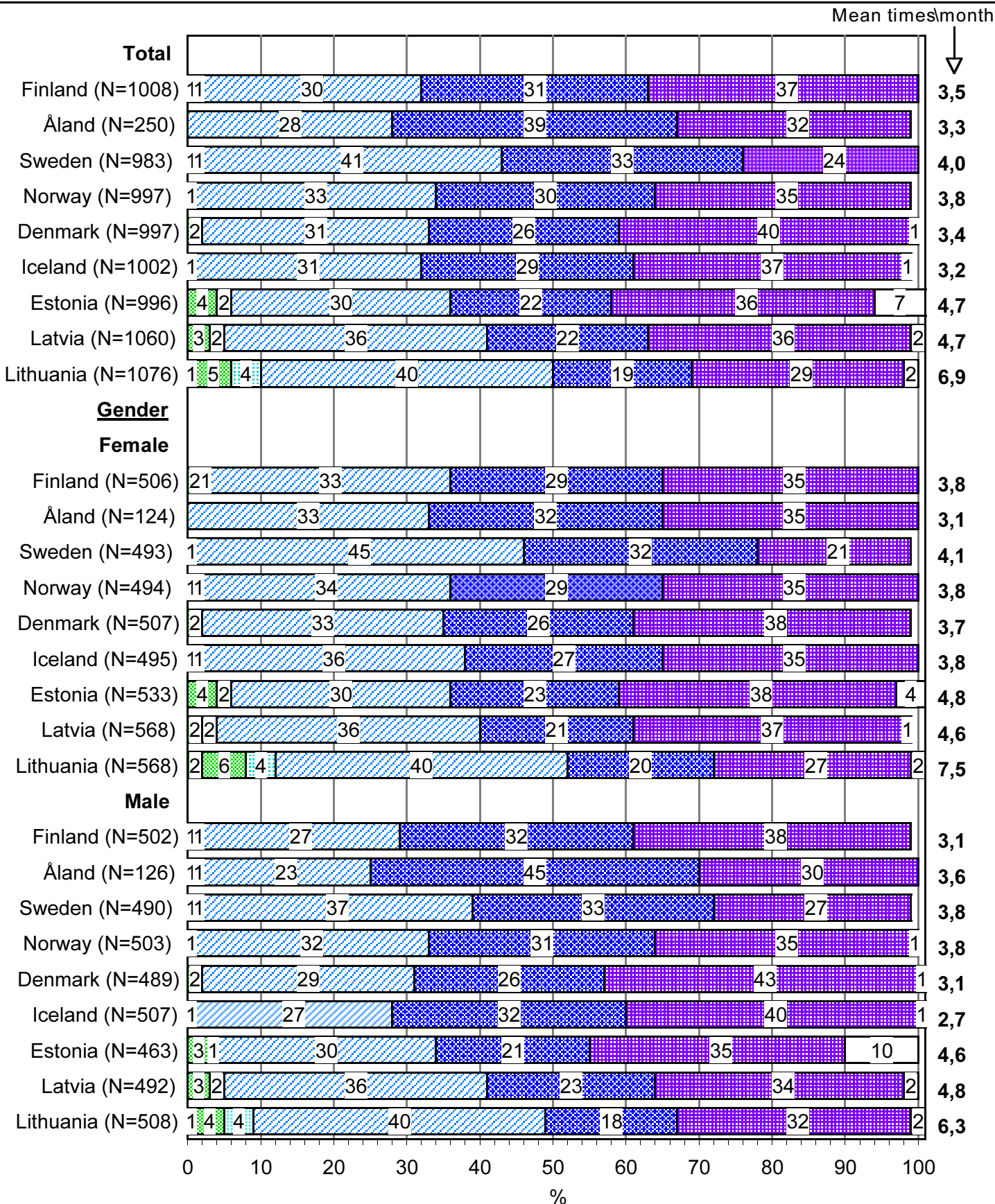
N=total weighted



Frequency of eating vegetables and roots FRIED OR WOK VEGETABLES/ROOTS

A Figure 5

N=total weighted

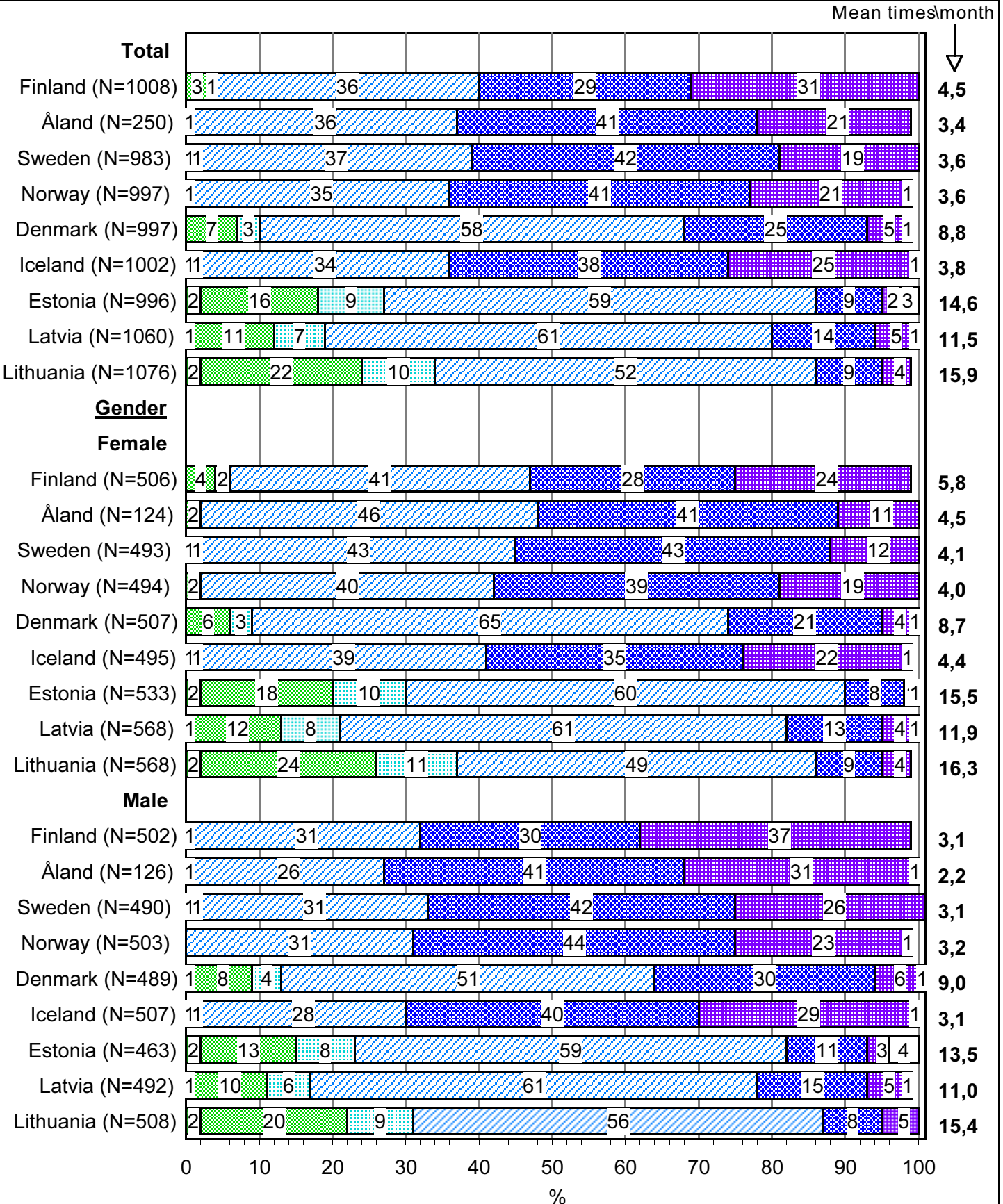


Frequency of eating vegetables and roots

VEGETABLE OR ROOT DISHES

A Figure 6

N=total weighted

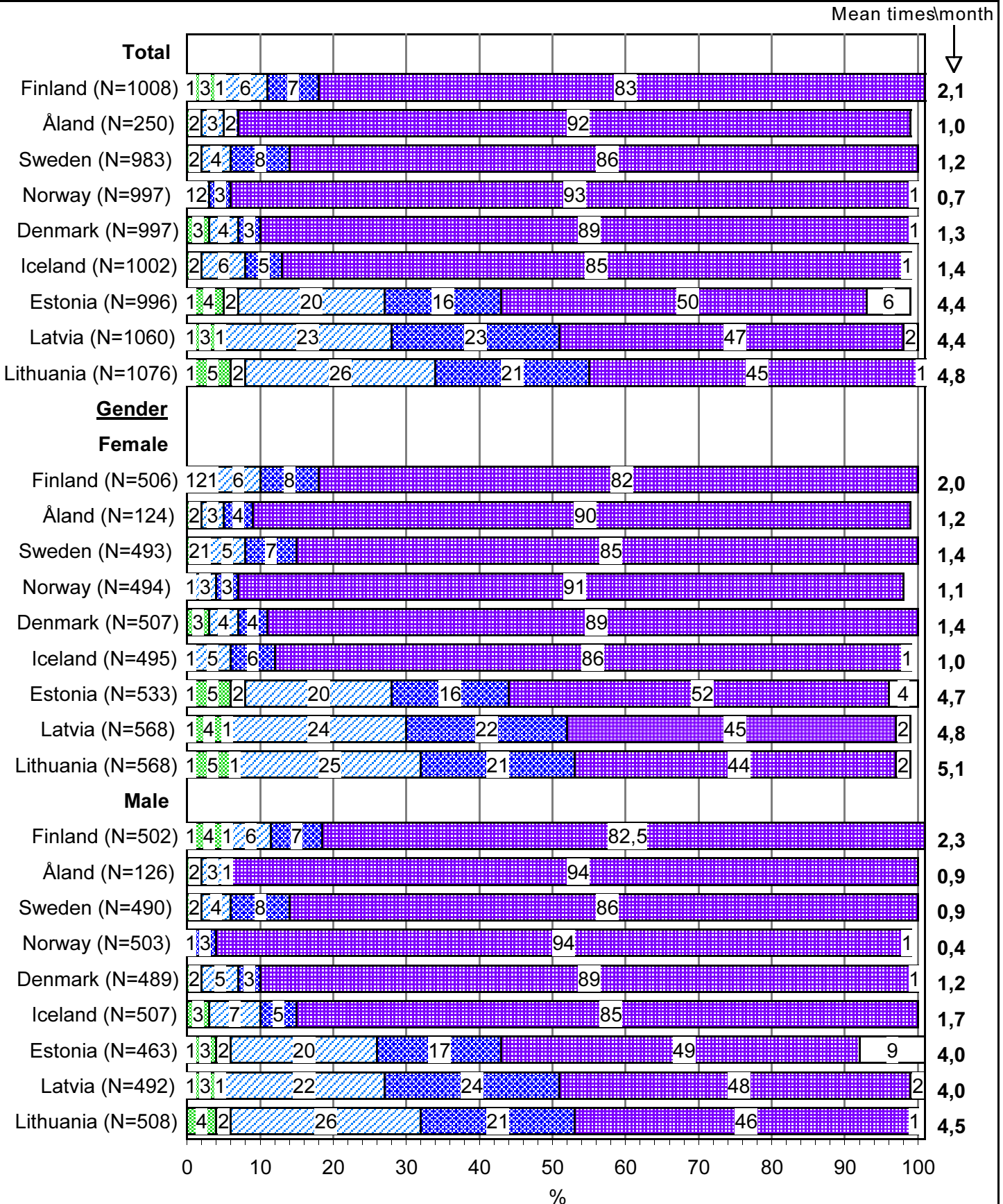


Frequency of eating vegetables and roots

VEGETABLE OR ROOT JUICE

A Figure 7

N=total weighted

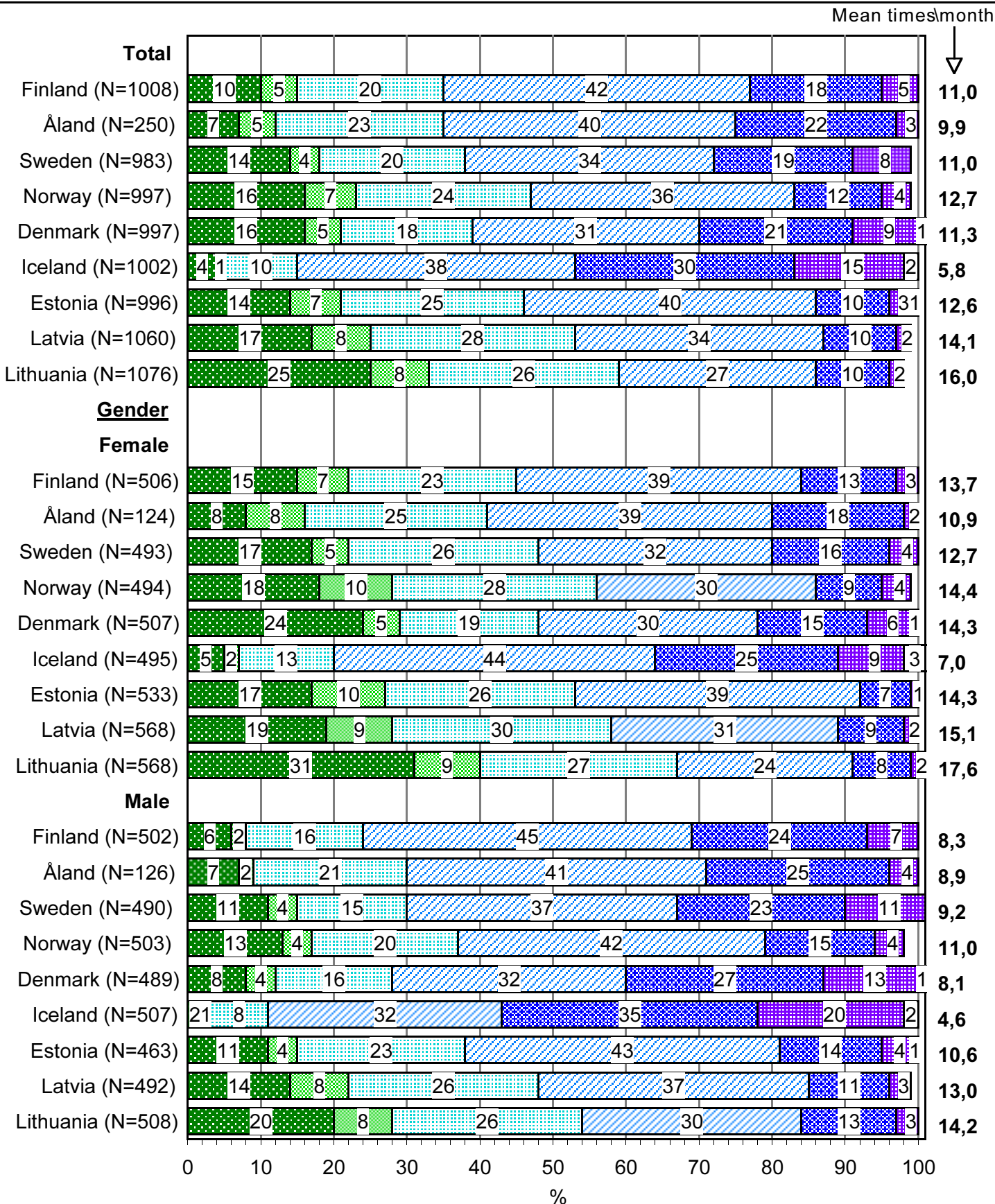


Frequency of eating different vegetables and roots

A Figure 8

CARROT

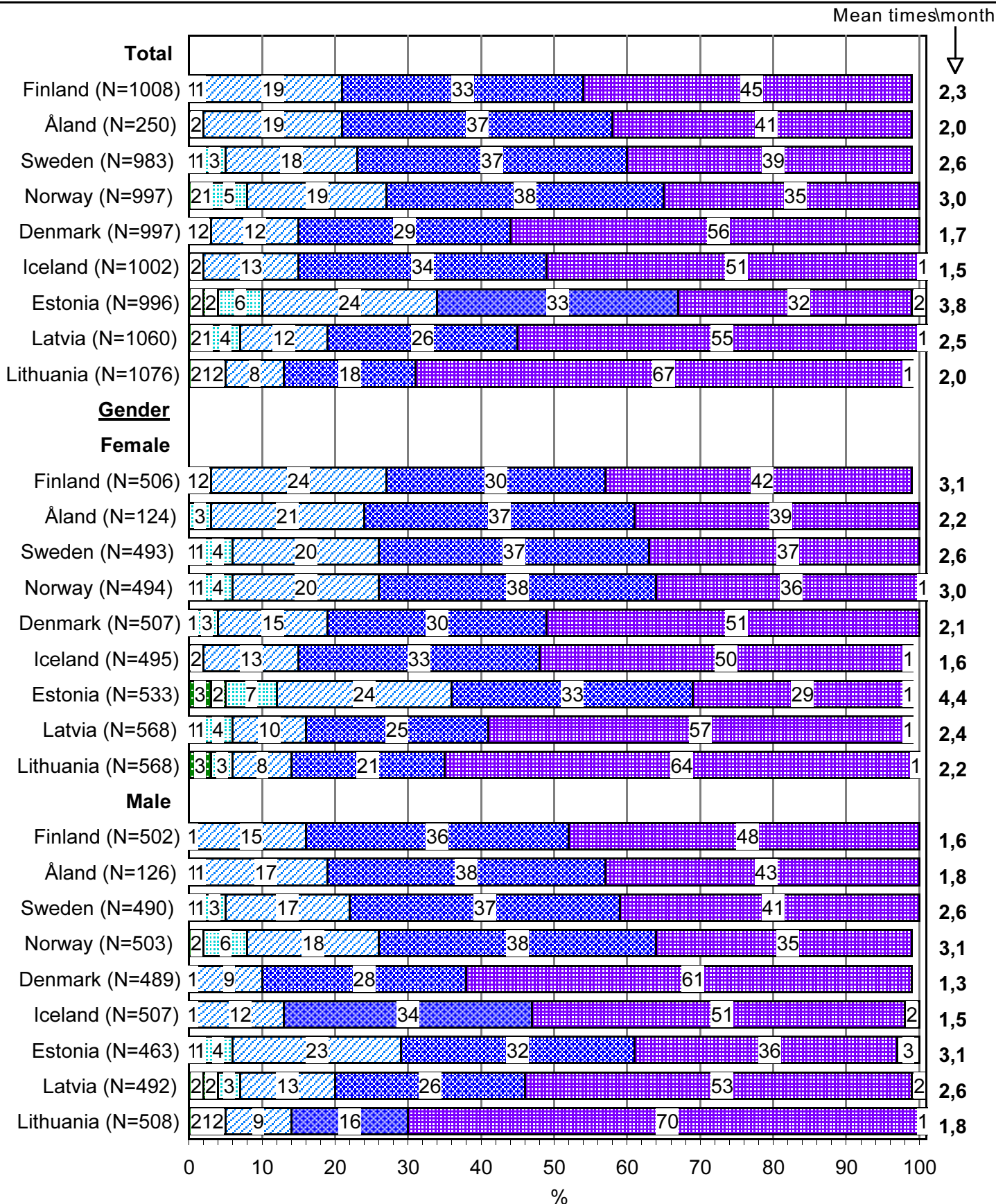
N=total weighted



Frequency of eating different vegetables and roots RUTABAGA, TURNIP, PARSNIP, ROOT PARSLEY

A Figure 9

N=total weighted

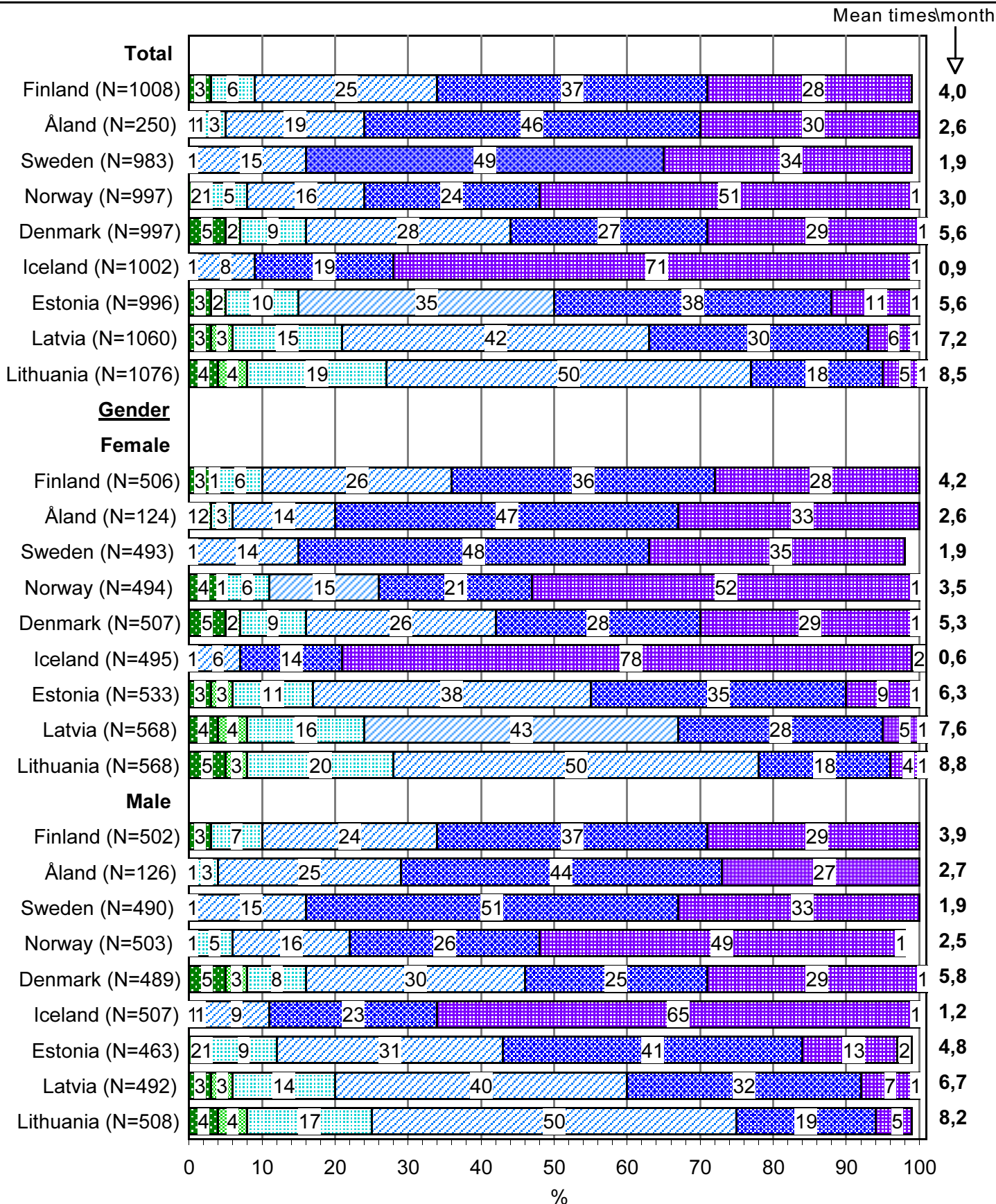


Frequency of eating different vegetables and roots

A Figure 10

RED BEET

N=total weighted

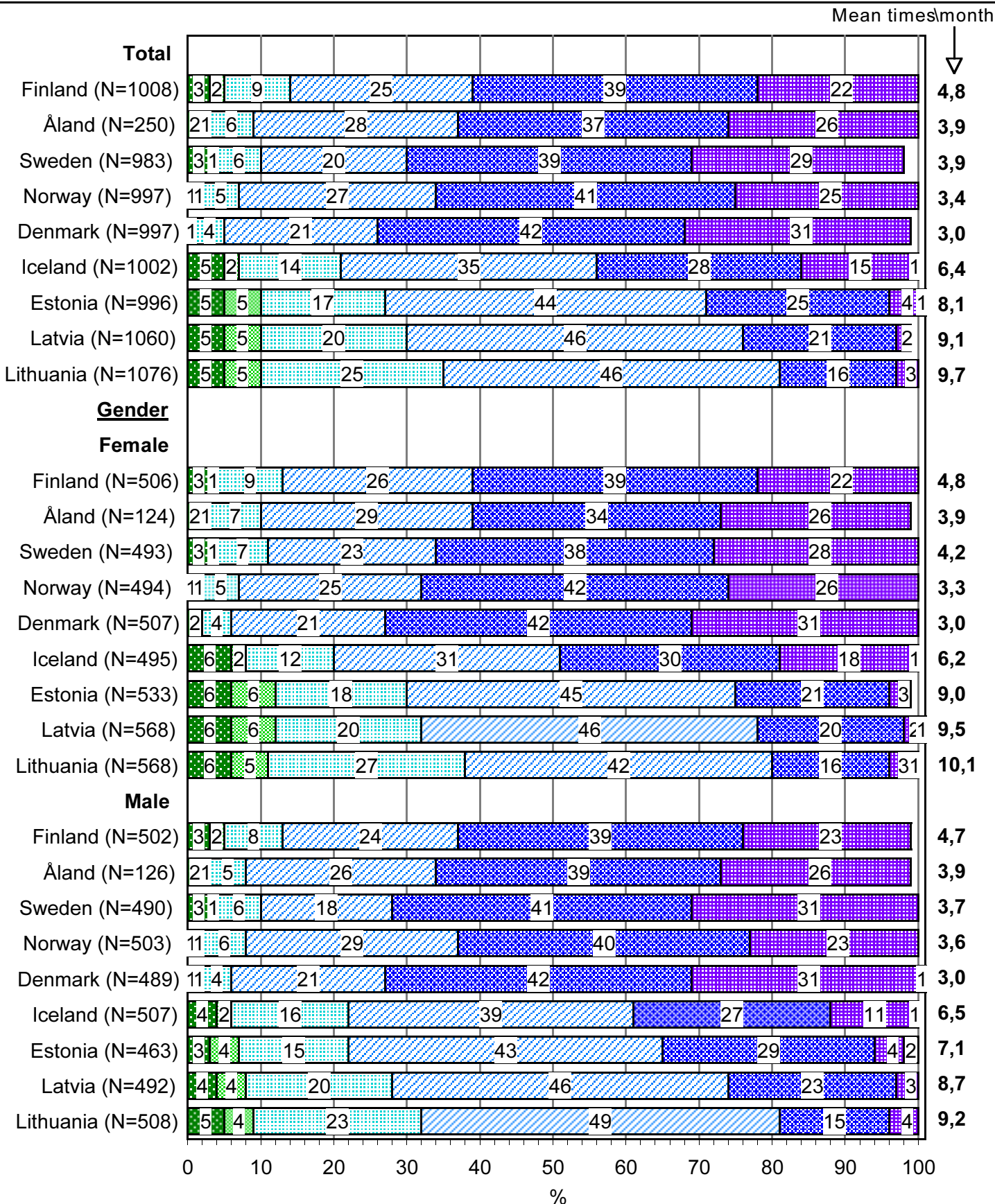


Frequency of eating different vegetables and roots

A Figure 11

CABBAGE

N=total weighted

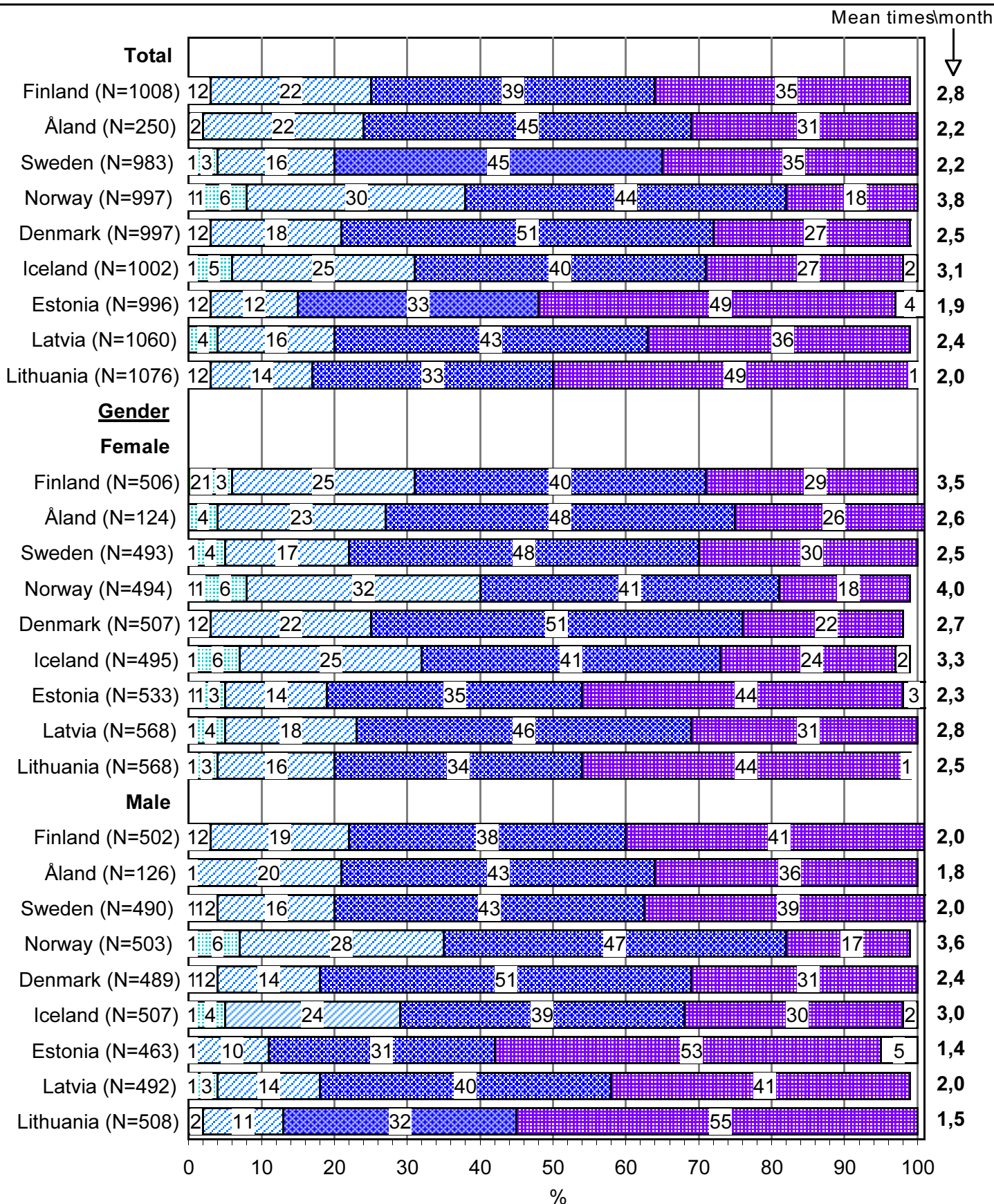


Frequency of eating different vegetables and roots

A Figure 12

CAULIFLOWER

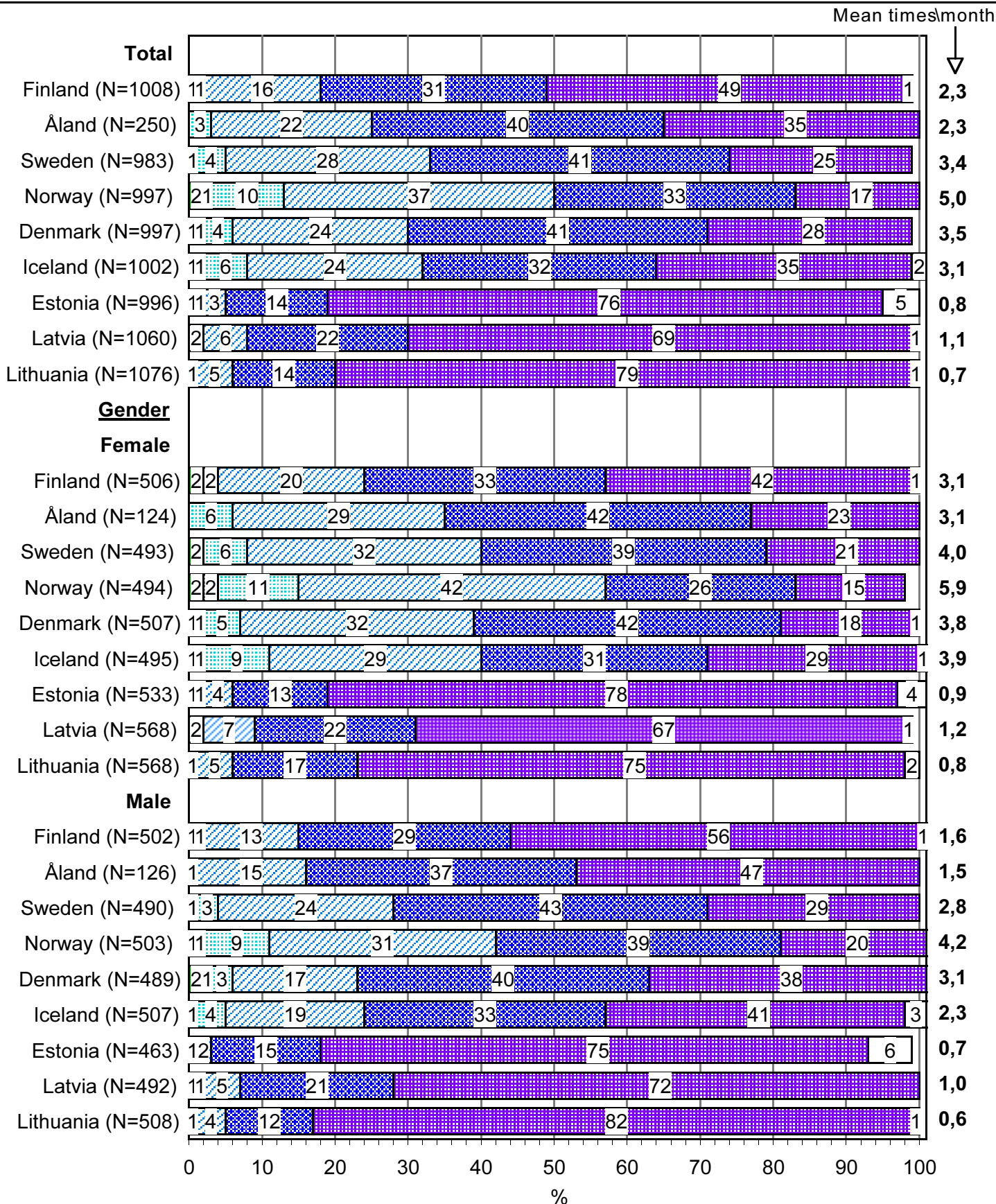
N=total weighted



Frequency of eating different vegetables and roots BROCCOLI, BRUSSEL SPROUTS

A Figure 13

N=total weighted

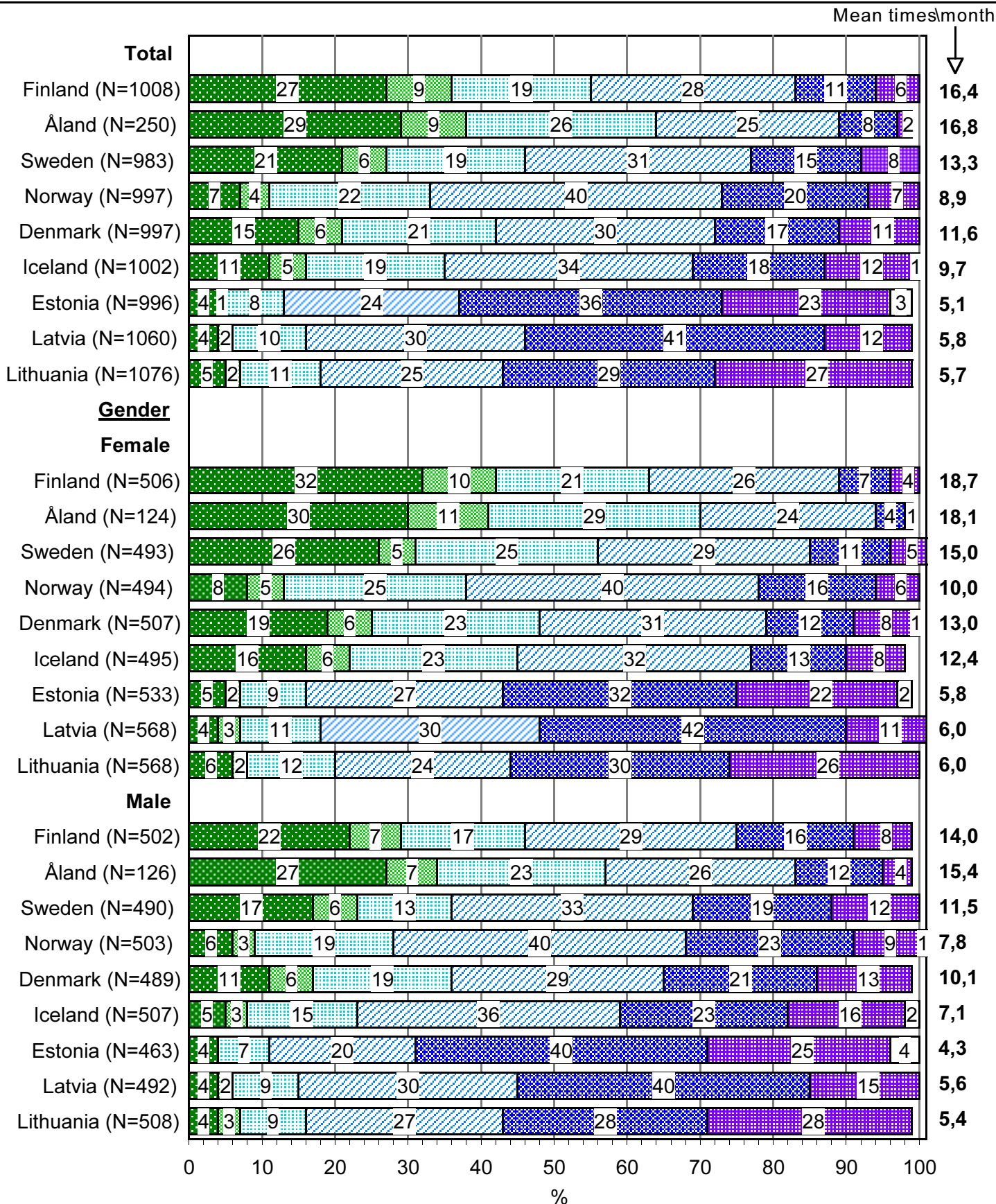


Frequency of eating different vegetables and roots

A Figure 14

GREEN SALAD

N=total weighted

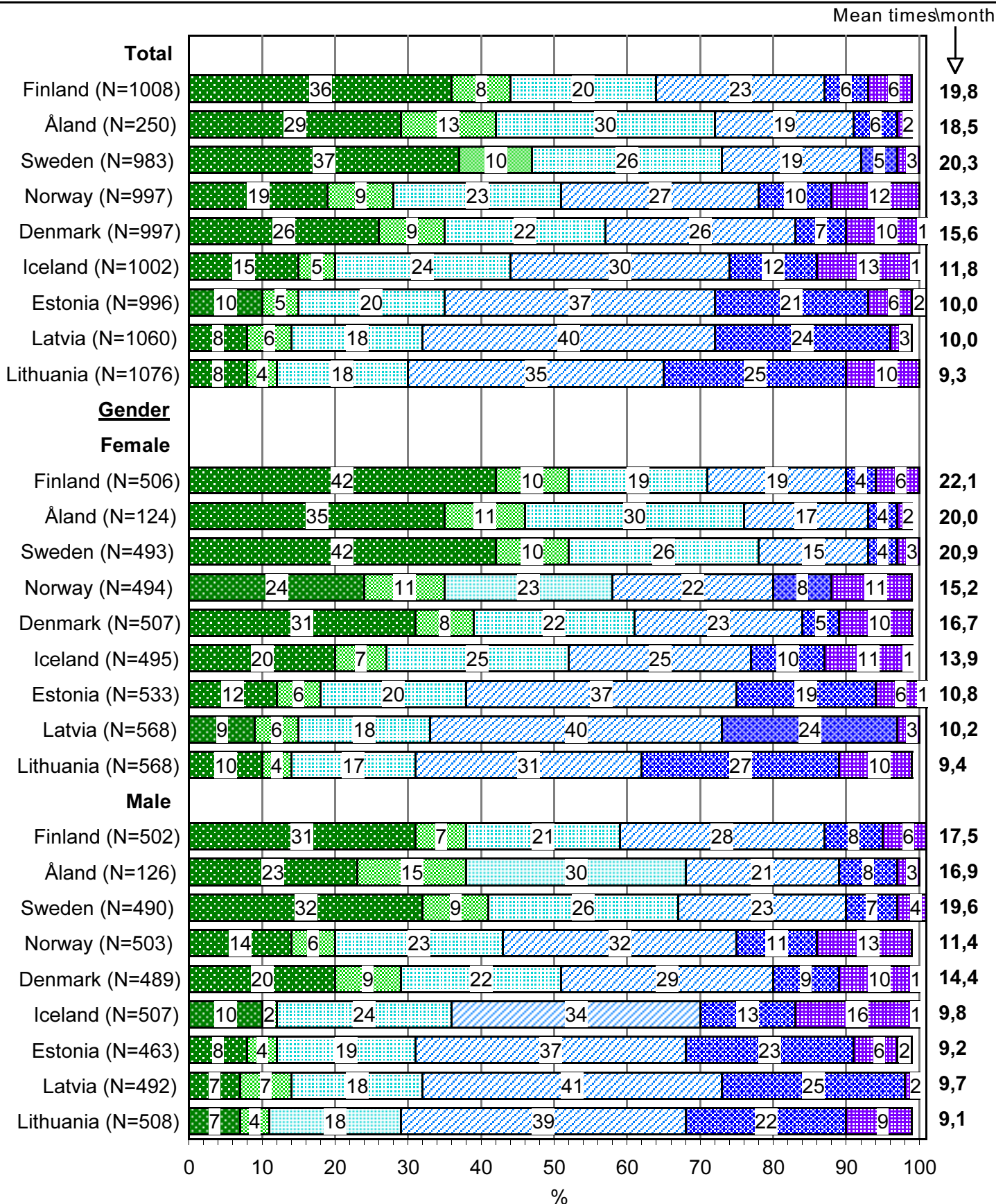


Frequency of eating different vegetables and roots

TOMATO

A Figure 15

N=total weighted

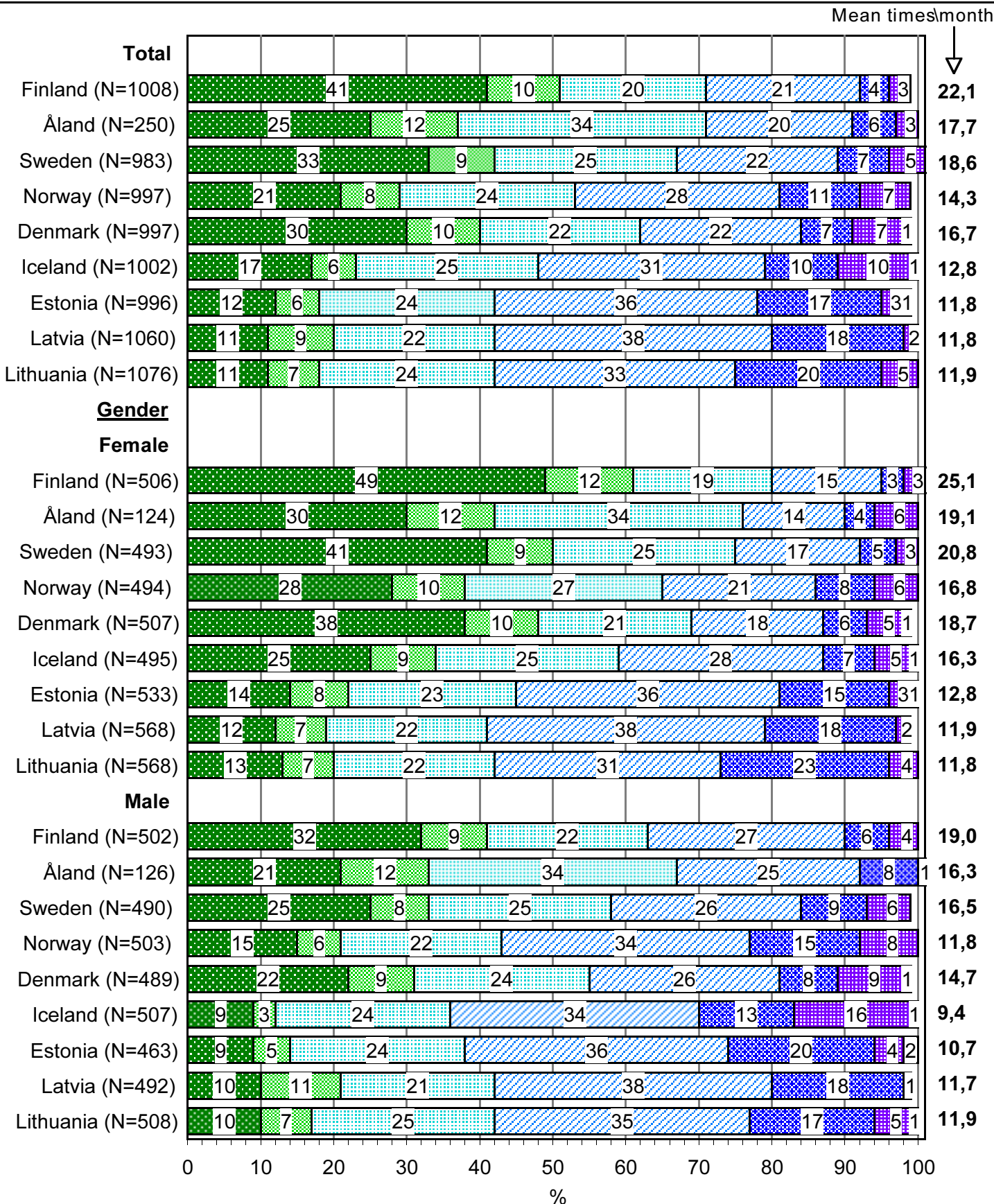


Frequency of eating different vegetables and roots

A Figure 16

CUCUMBER

N=total weighted

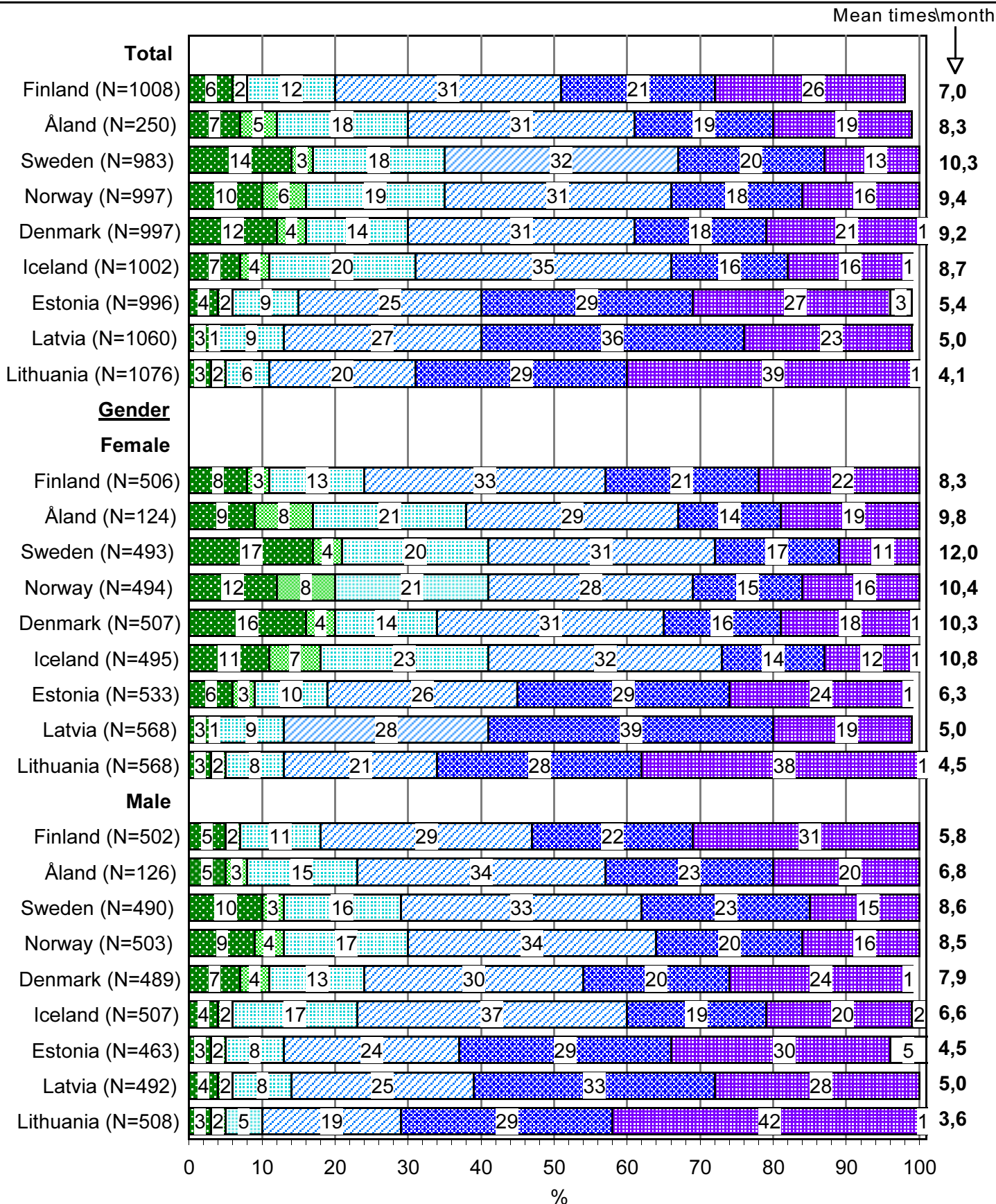


Frequency of eating different vegetables and roots

A Figure 17

SWEET PEPPER

N=total weighted



Frequency of eating different vegetables and roots

A Figure 18

SPINACH

N=total weighted

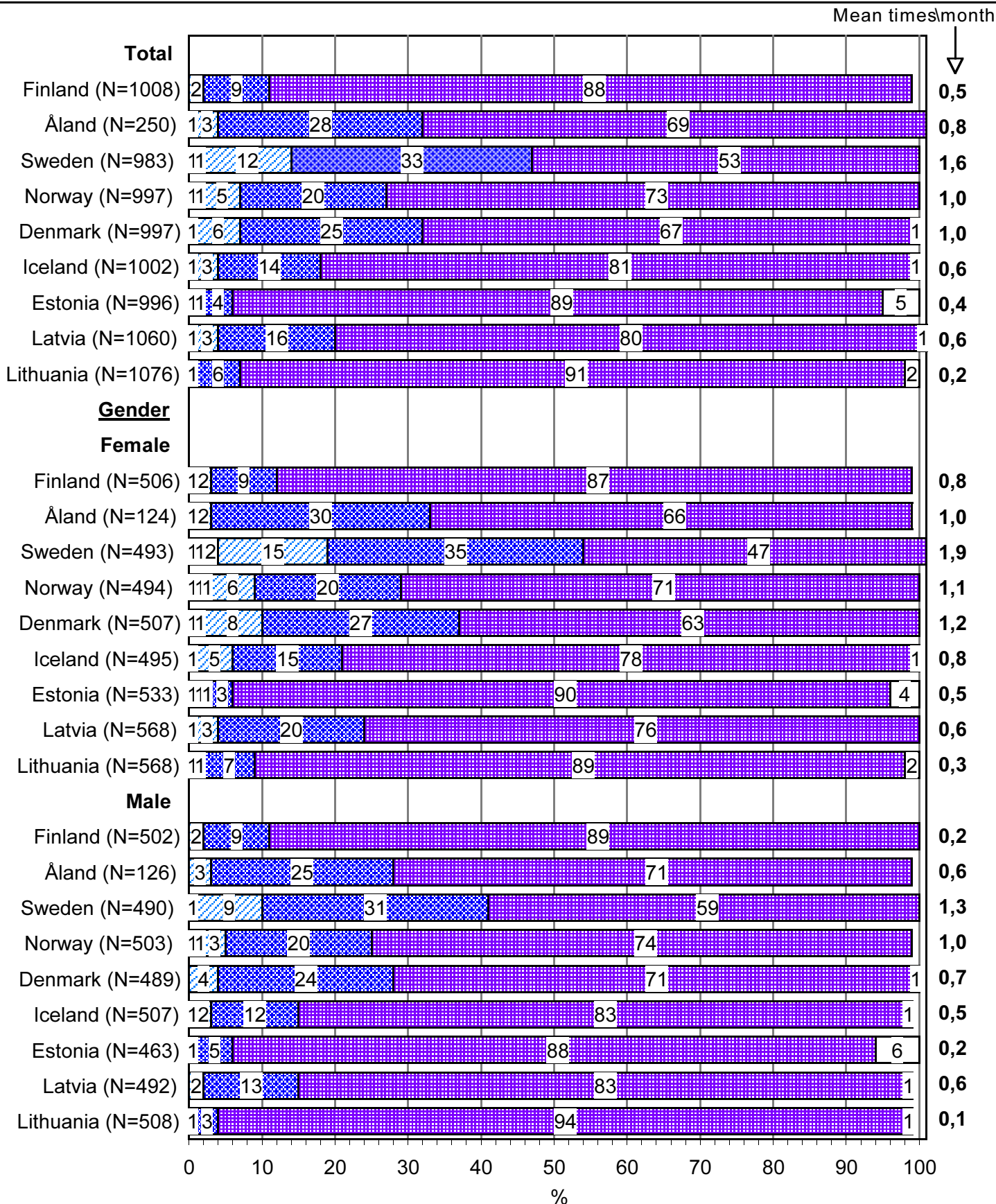


Frequency of eating different vegetables and roots

A Figure 19

AVOCADO

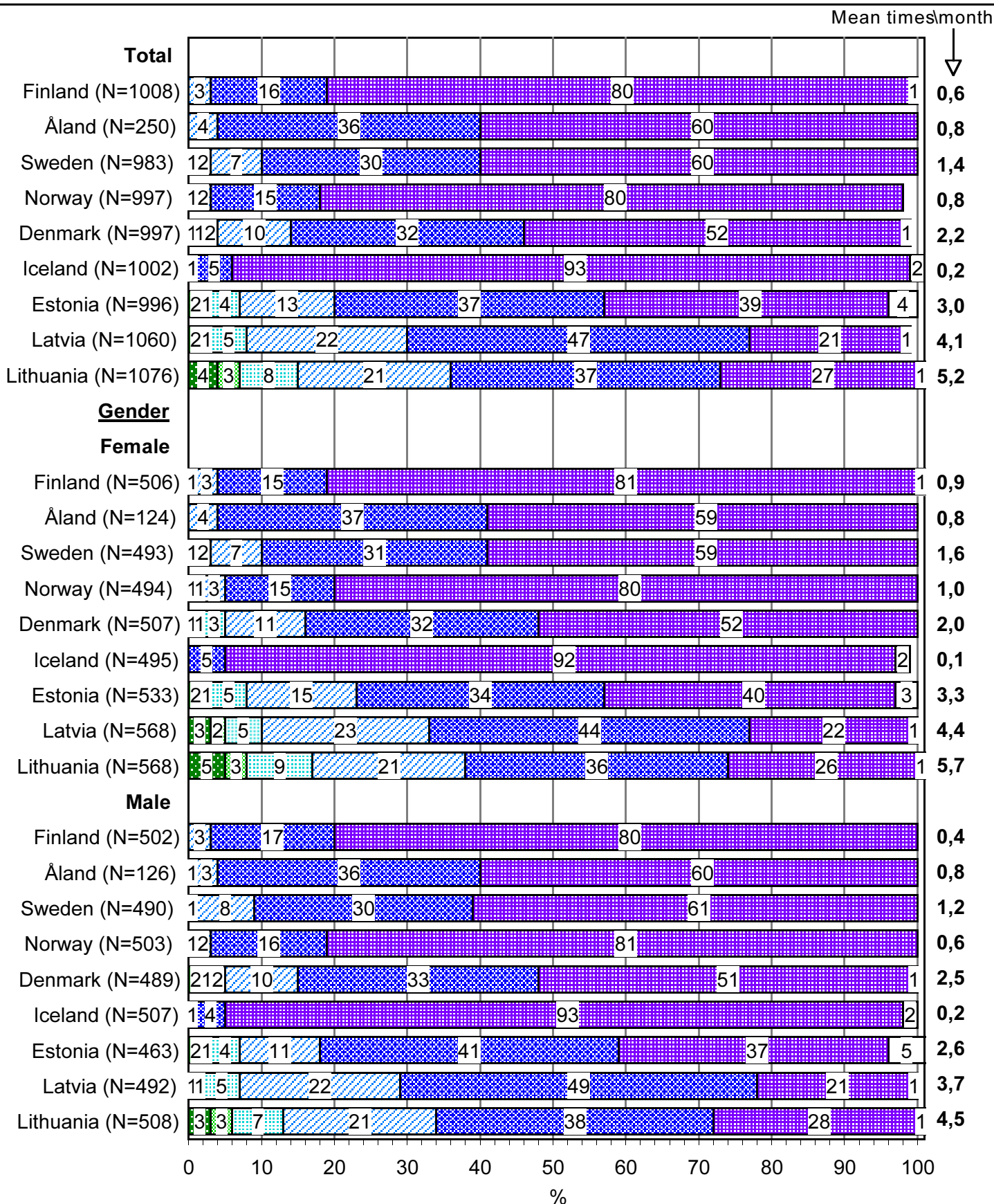
N=total weighted



Frequency of eating different vegetables and roots RADISH, BLACK RADISH

A Figure 20

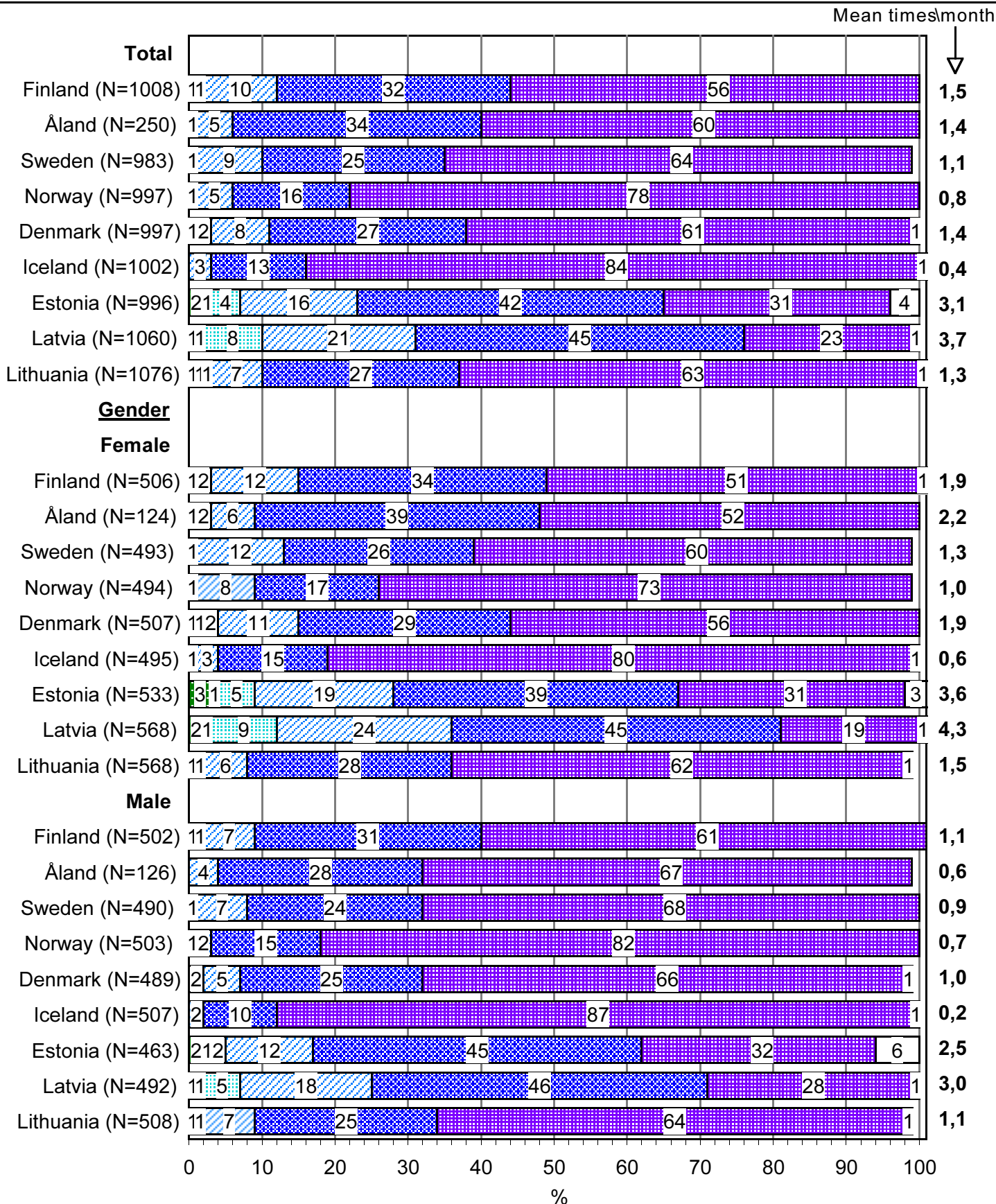
N=total weighted



Frequency of eating different vegetables and roots PUMPKIN, MARROW, AUBERGINE

A Figure 21

N=total weighted

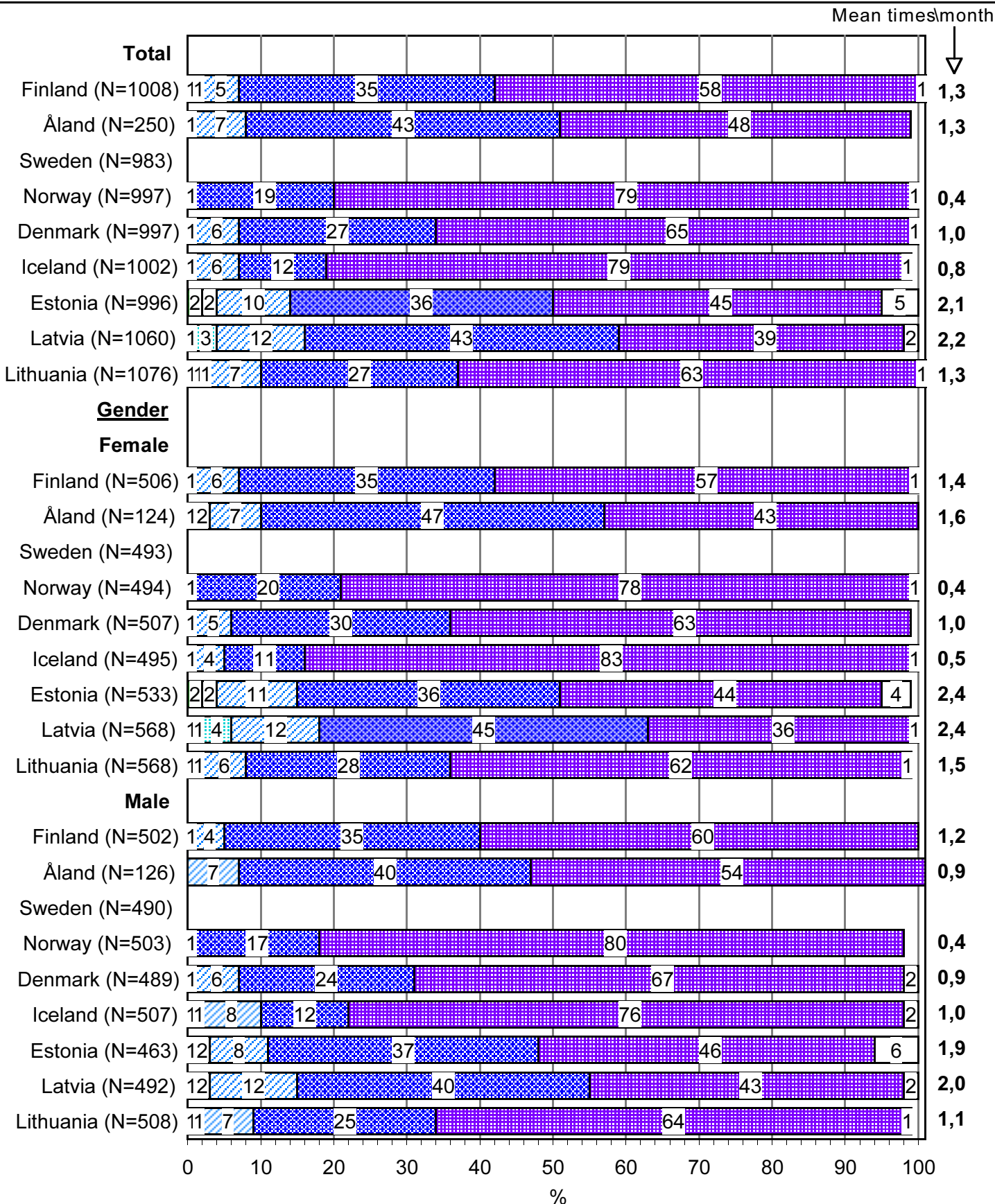


Frequency of eating different vegetables and roots

A Figure 22

RHUBARB

N=total weighted

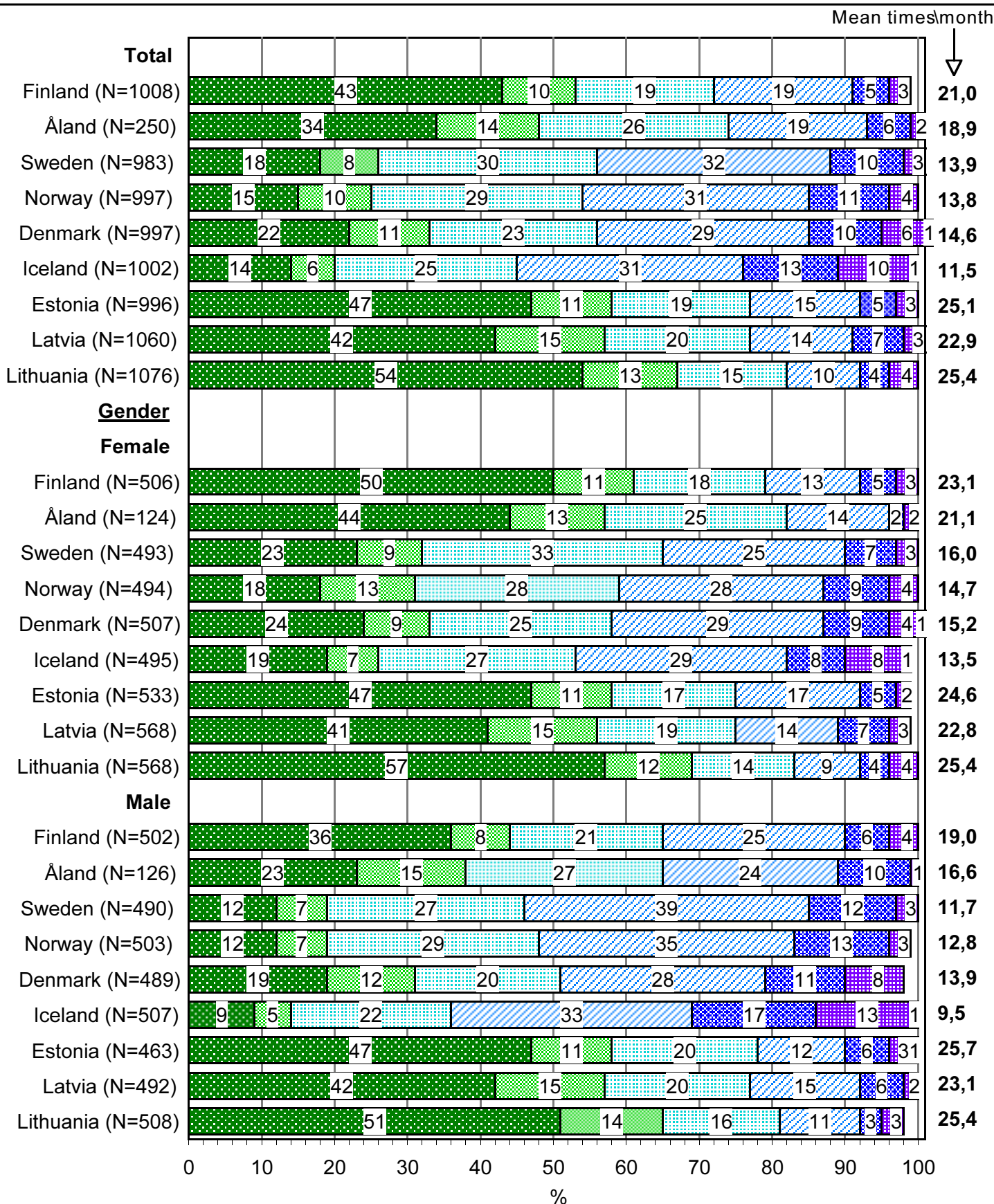


Frequency of eating different vegetables and roots

ONION, LEEK, GARLIC

A Figure 23

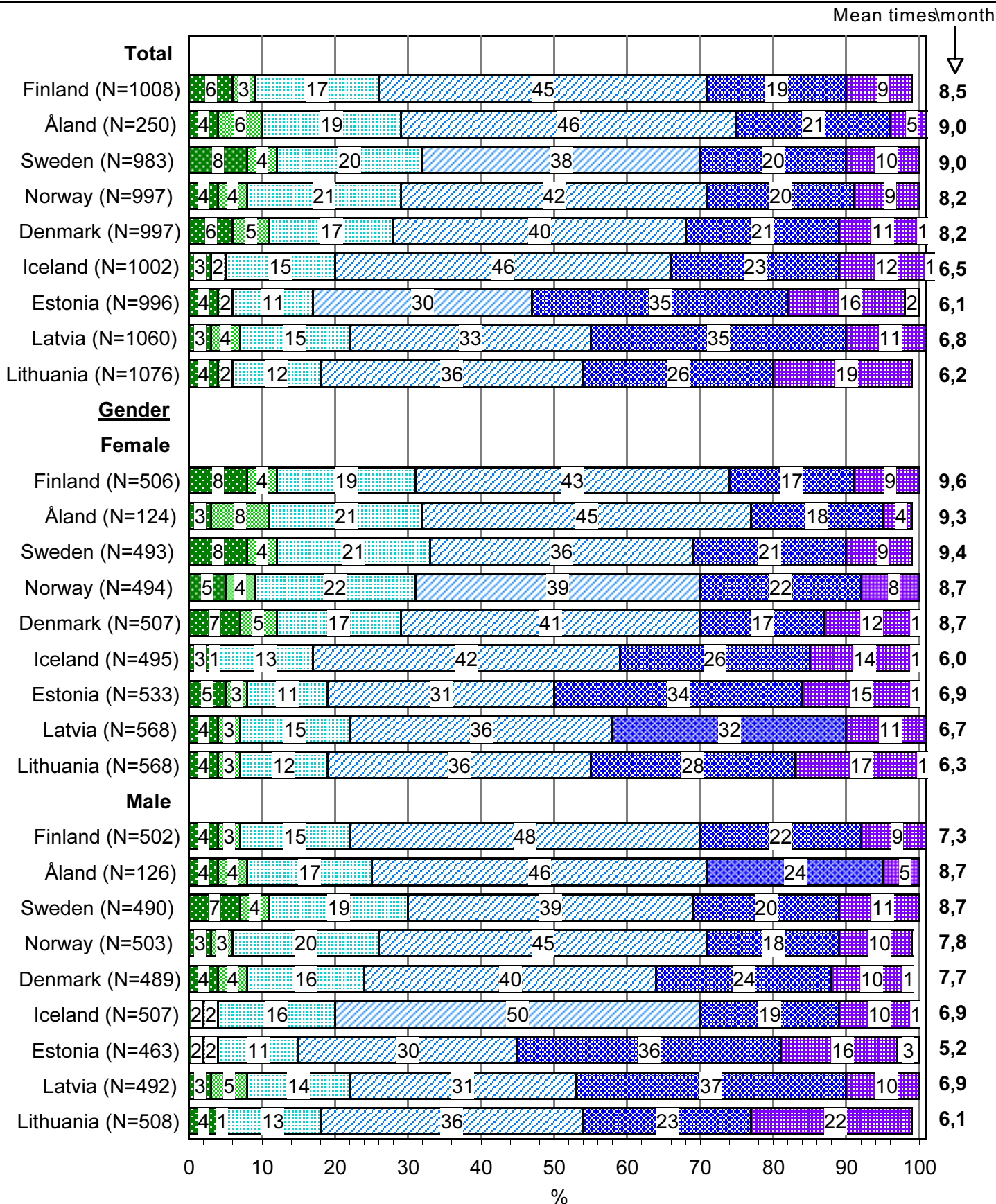
N=total weighted



Frequency of eating different vegetables and roots PEAS, CORN, MIXED VEGETABLES

A Figure 24

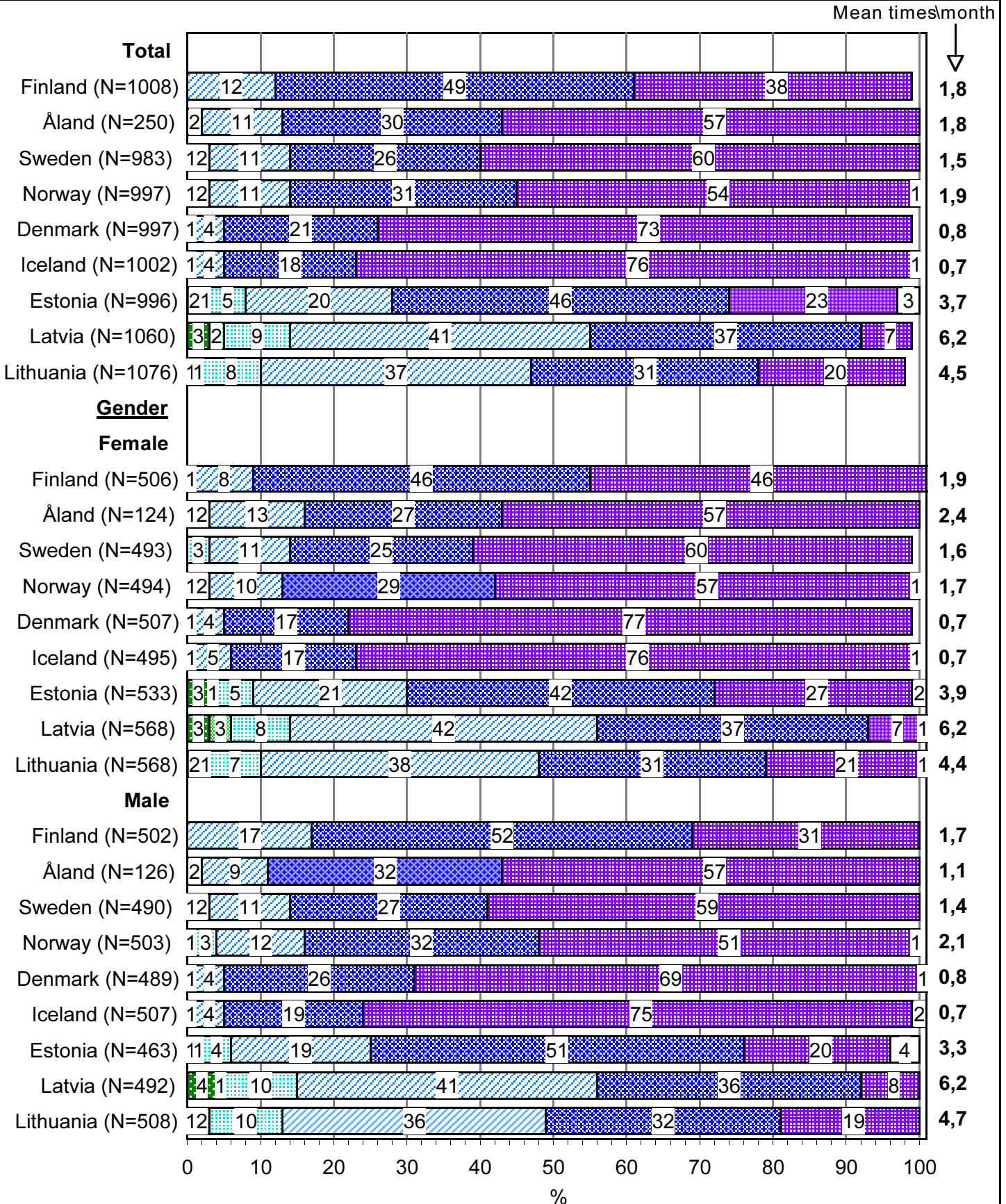
N=total weighted



Frequency of eating different vegetables and roots FOODS PREPARED OF DRIED PEAS, BEANS AND LENTILS

A Figure 25

N=total weighted

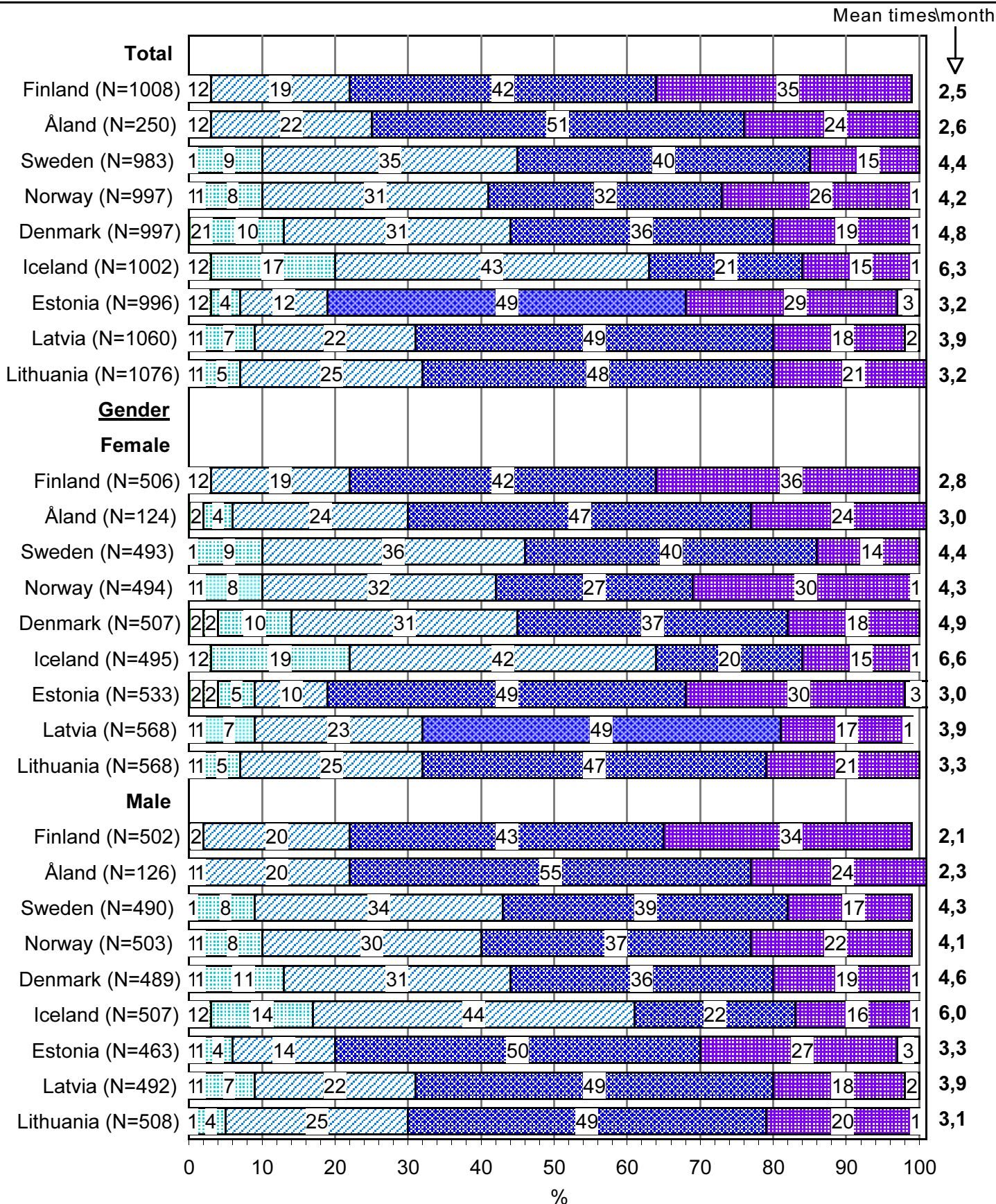


Frequency of eating different vegetables and roots

A Figure 26

MUSHROOMS

N=total weighted

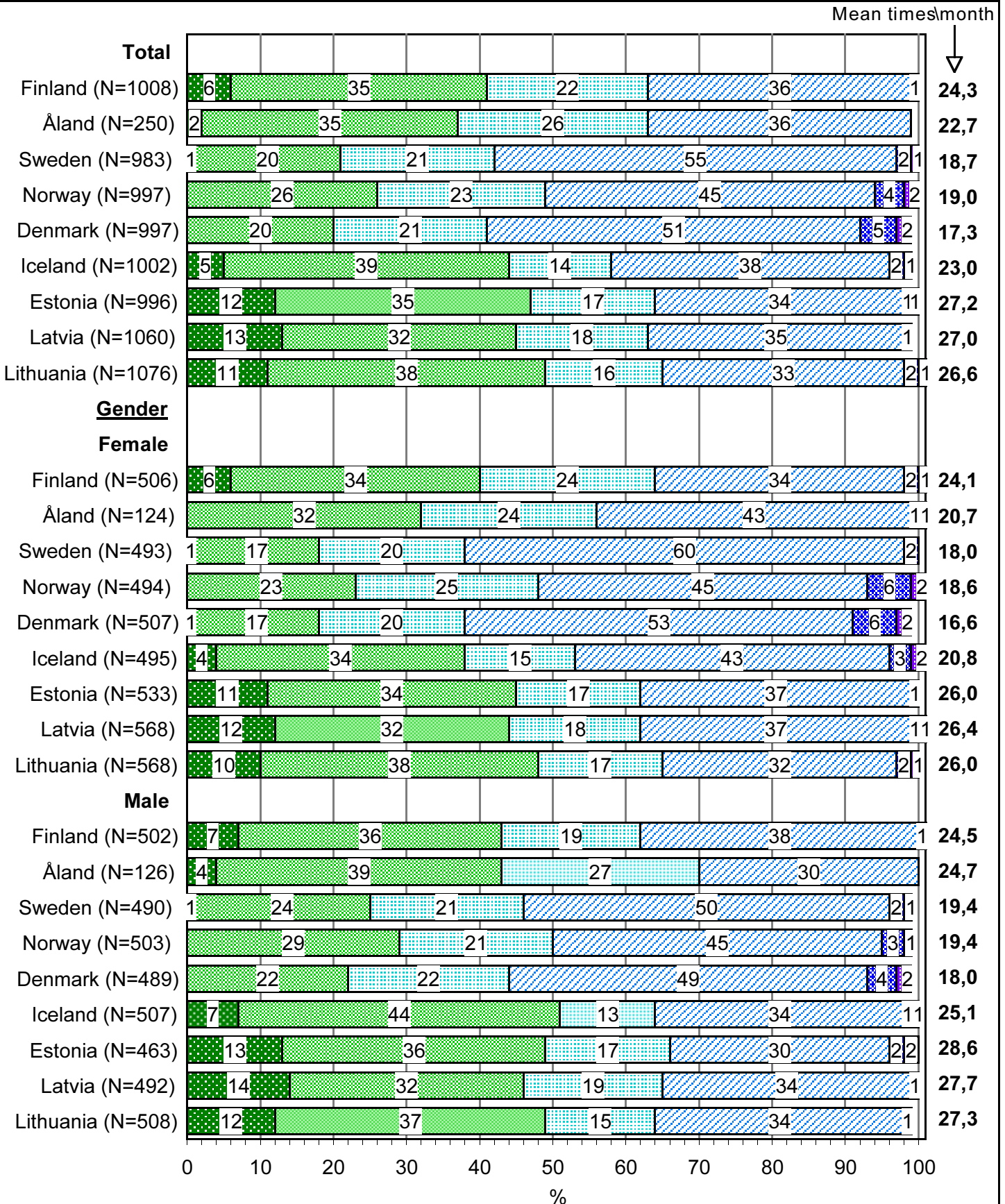


Frequency of eating potatoes

POTATOES, ALL TYPES TOTAL

A Figure 27

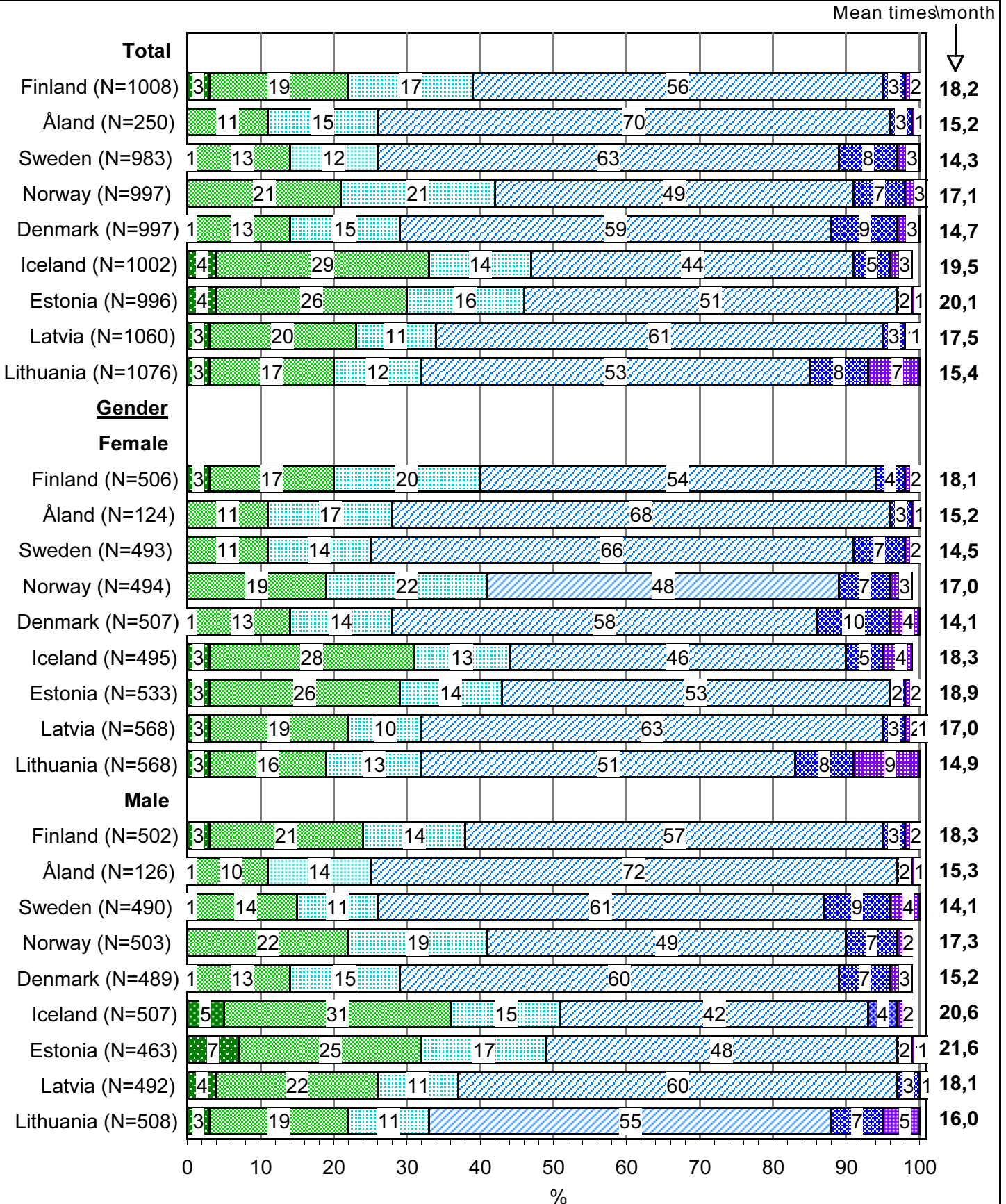
N=total weighted



Frequency of eating potatoes BOILED OR BAKED POTATOES

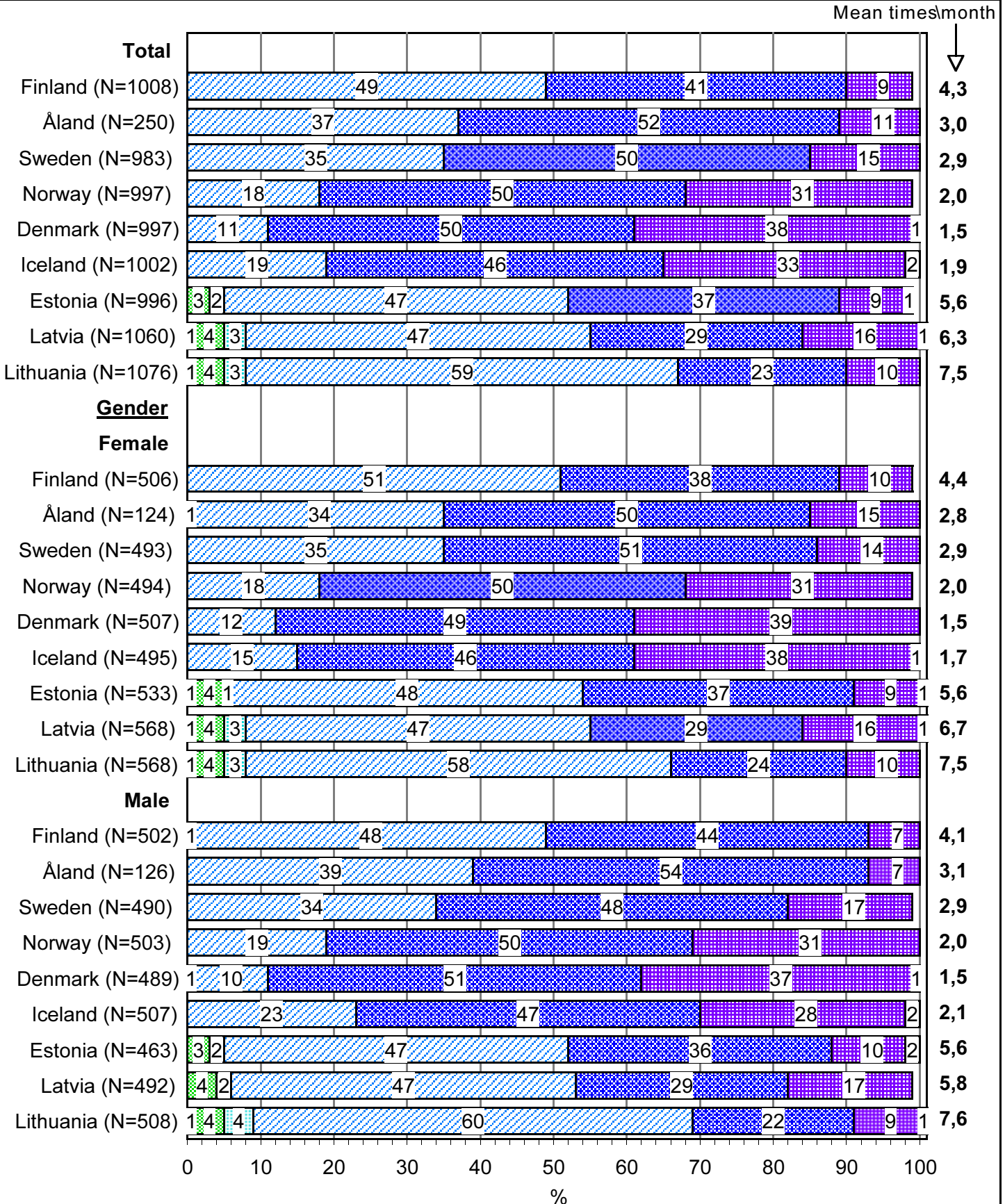
A Figure 28

N=total weighted



Frequency of eating potatoes MASHED POTATOES

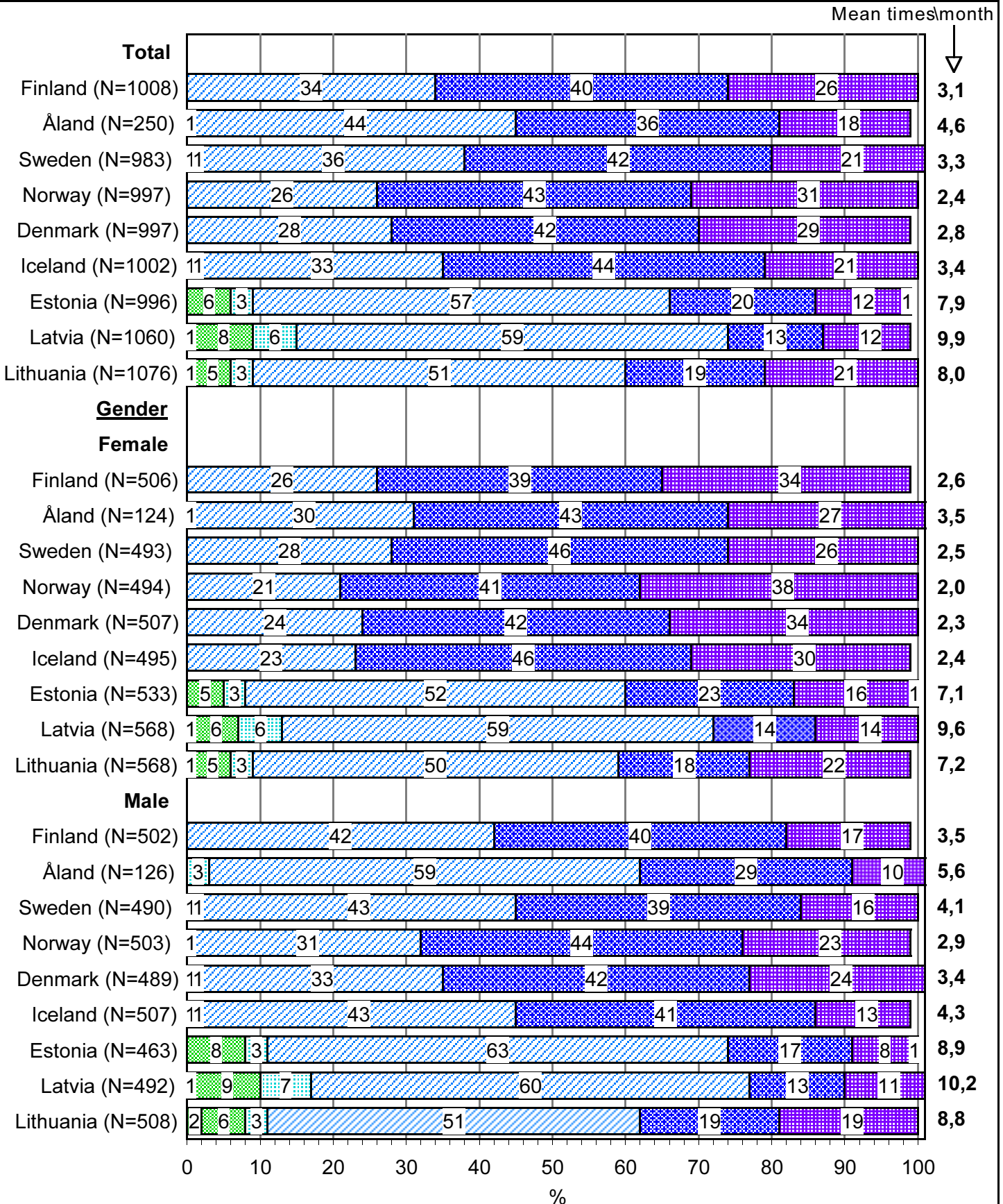
N=total weighted



Frequency of eating potatoes FRIED POTATOES, FRENCH FRIES

A Figure 30

N=total weighted



Frequency of eating fruit and berries

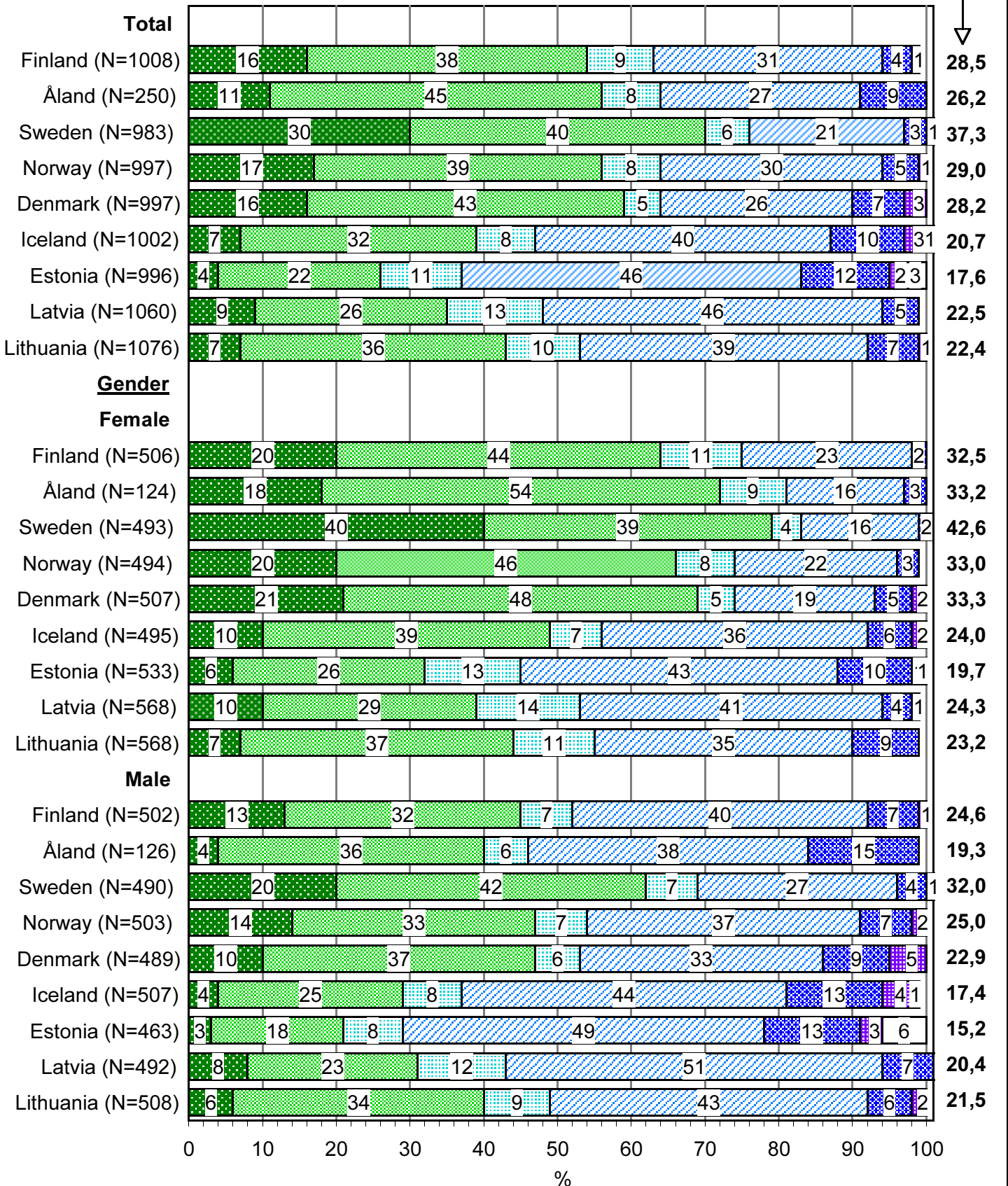
FRUIT AND BERRIES OF ALL SORTS, TOTAL

A Figure 31

N=total weighted



Mean times/month

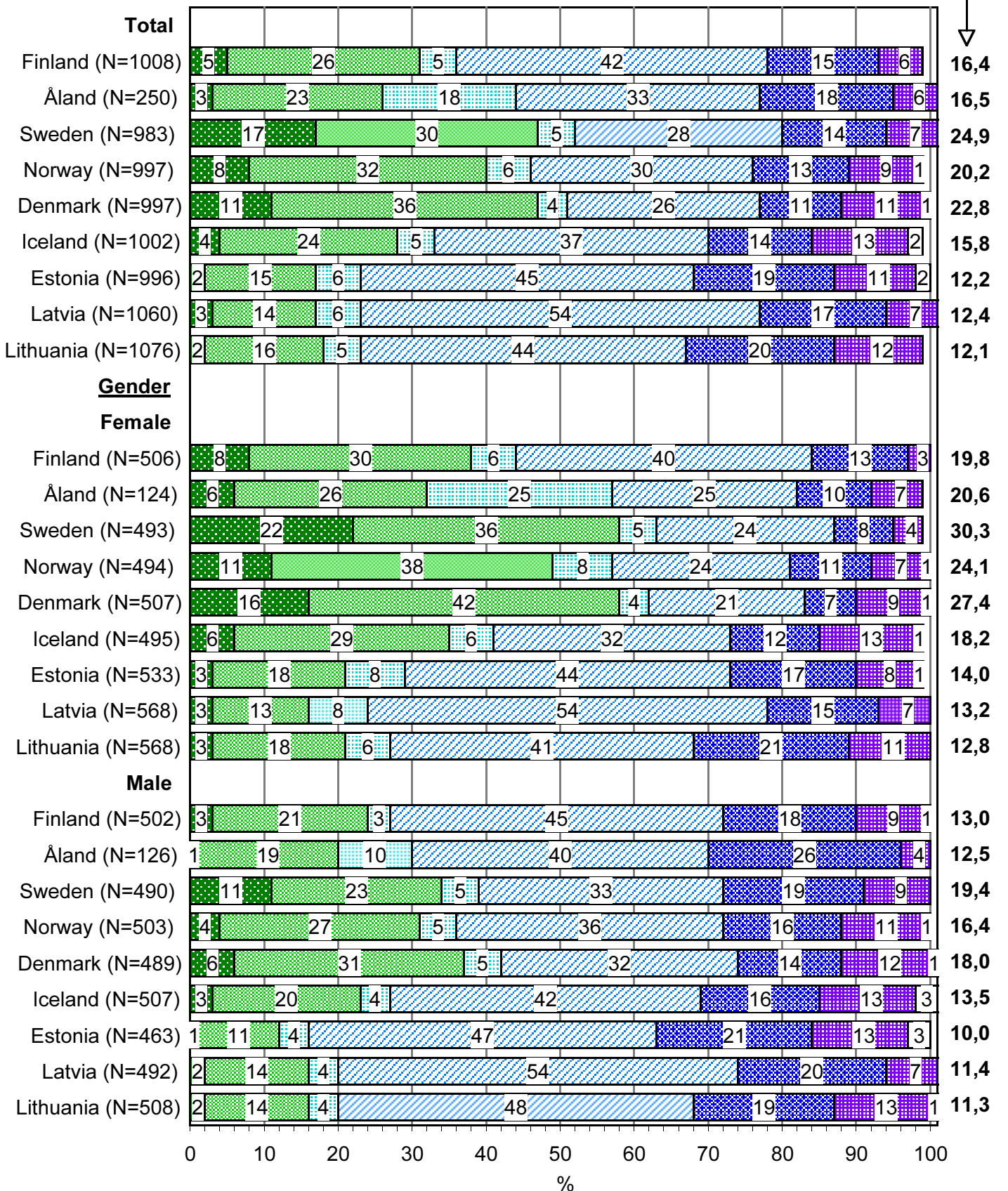


Frequency of eating fruit and berries FRESH OR FROZEN FRUIT/BERRIES, MASHED FRUIT/BERRIES

N=total weighted



Mean times/month



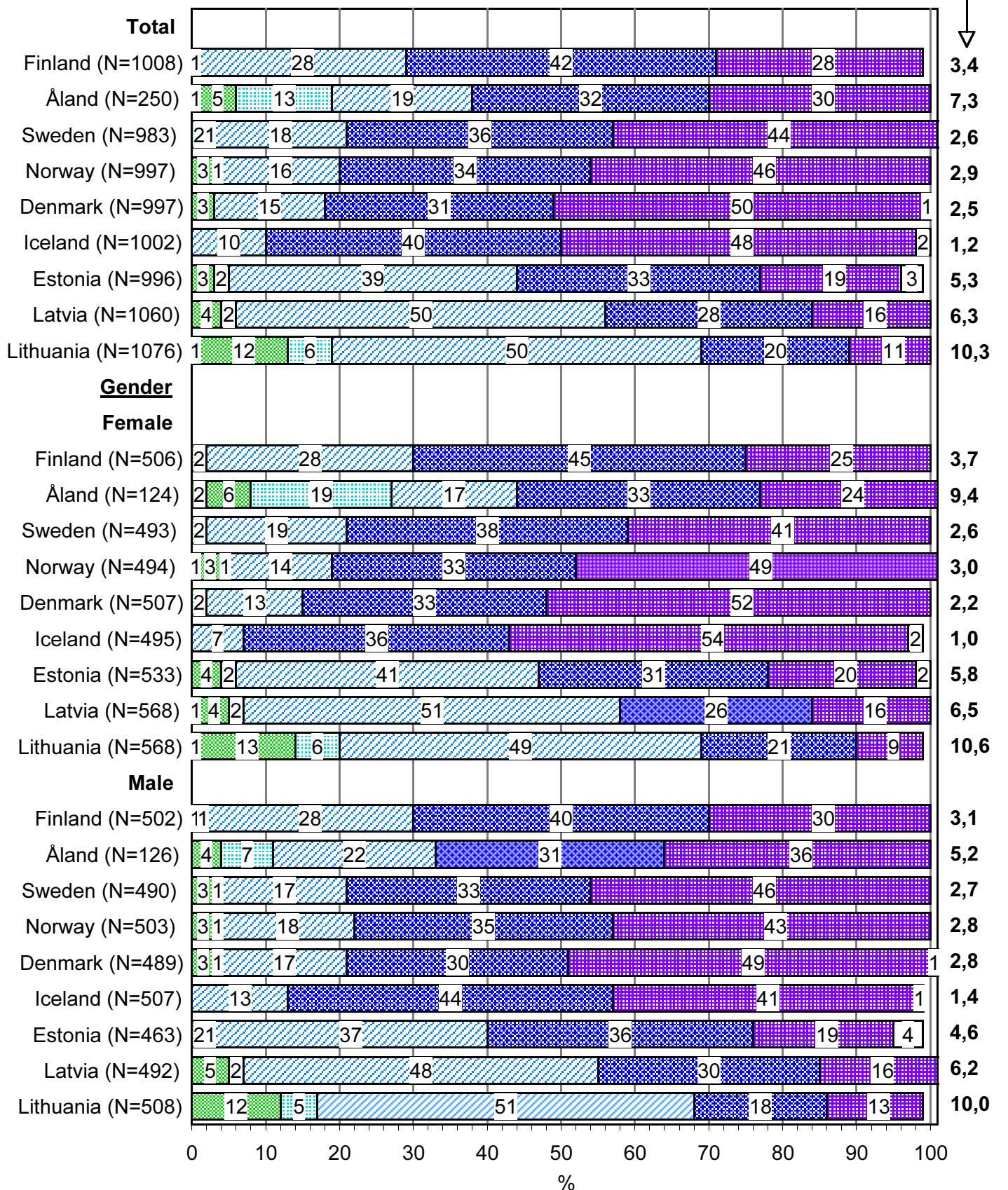
Frequency of eating fruit and berries

CANNED FRUIT/BERRIES, COOKED FRUIT/BERRIES

N=total weighted



Mean times/month



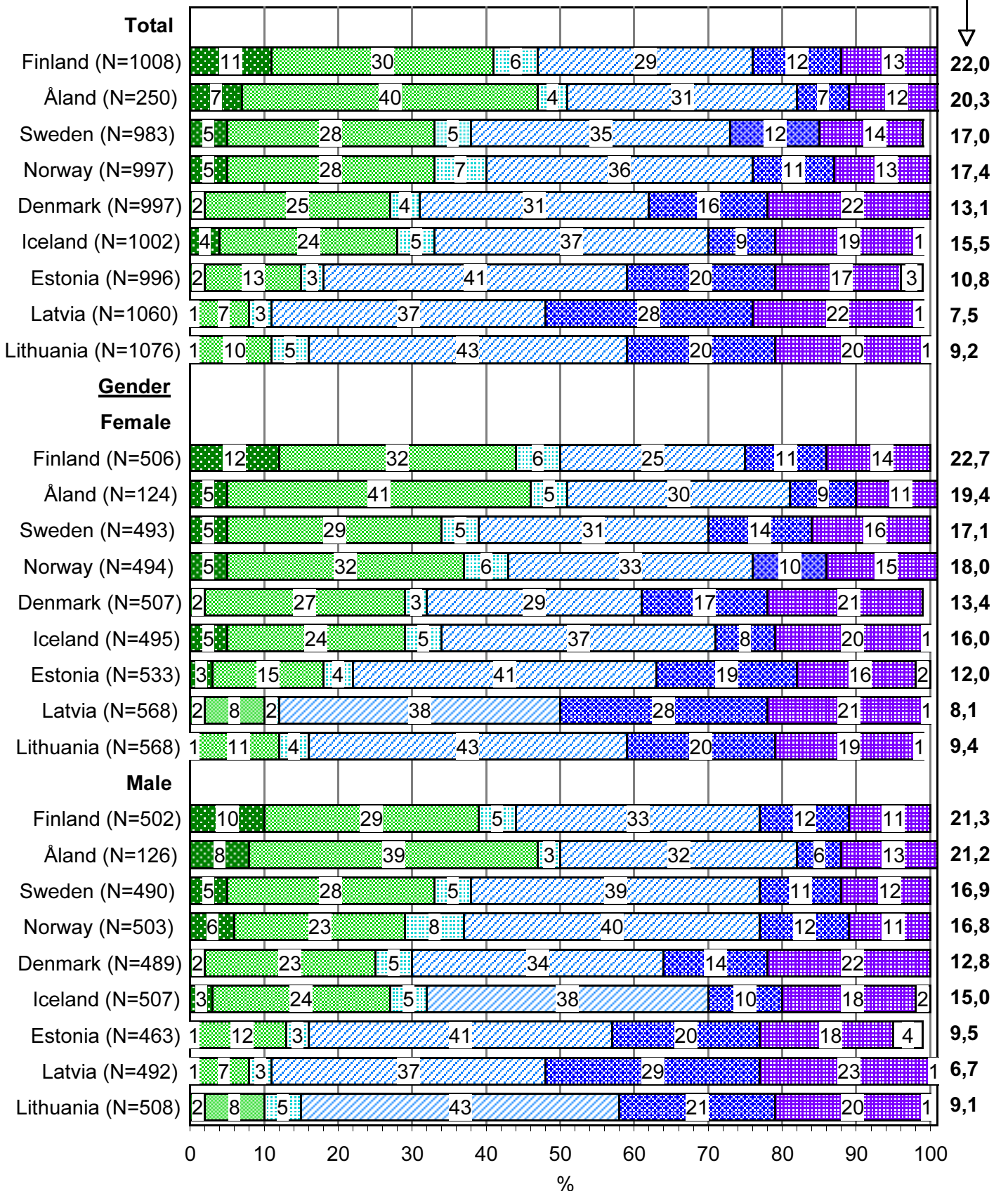
Frequency of eating fruit and berries FRUIT JUICE/BERRY JUICE

A Figure 34

N=total weighted



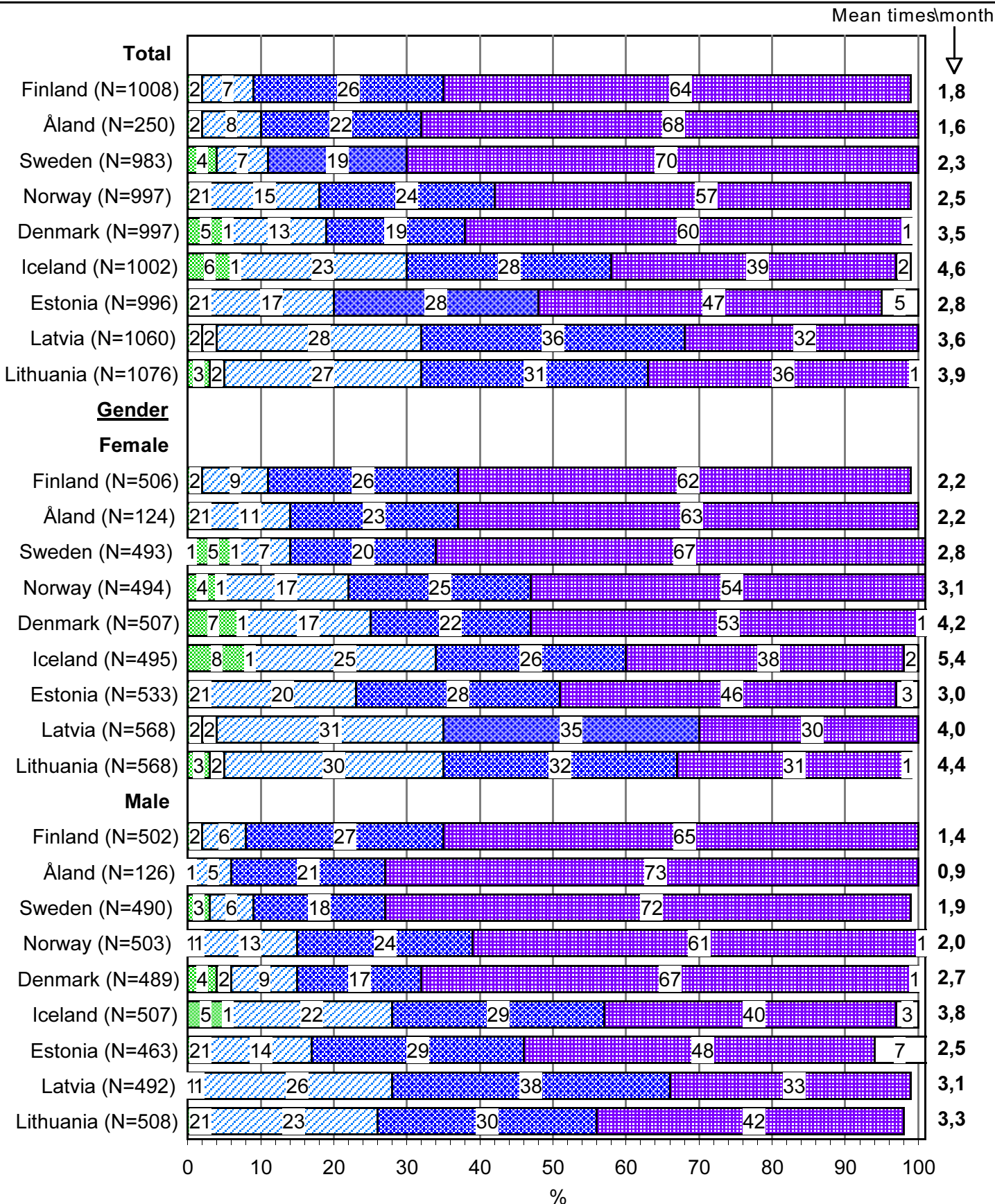
Mean times/month



Frequency of eating fruit and berries DRIED FRUIT/BERRIES

A Figure 35

N=total weighted

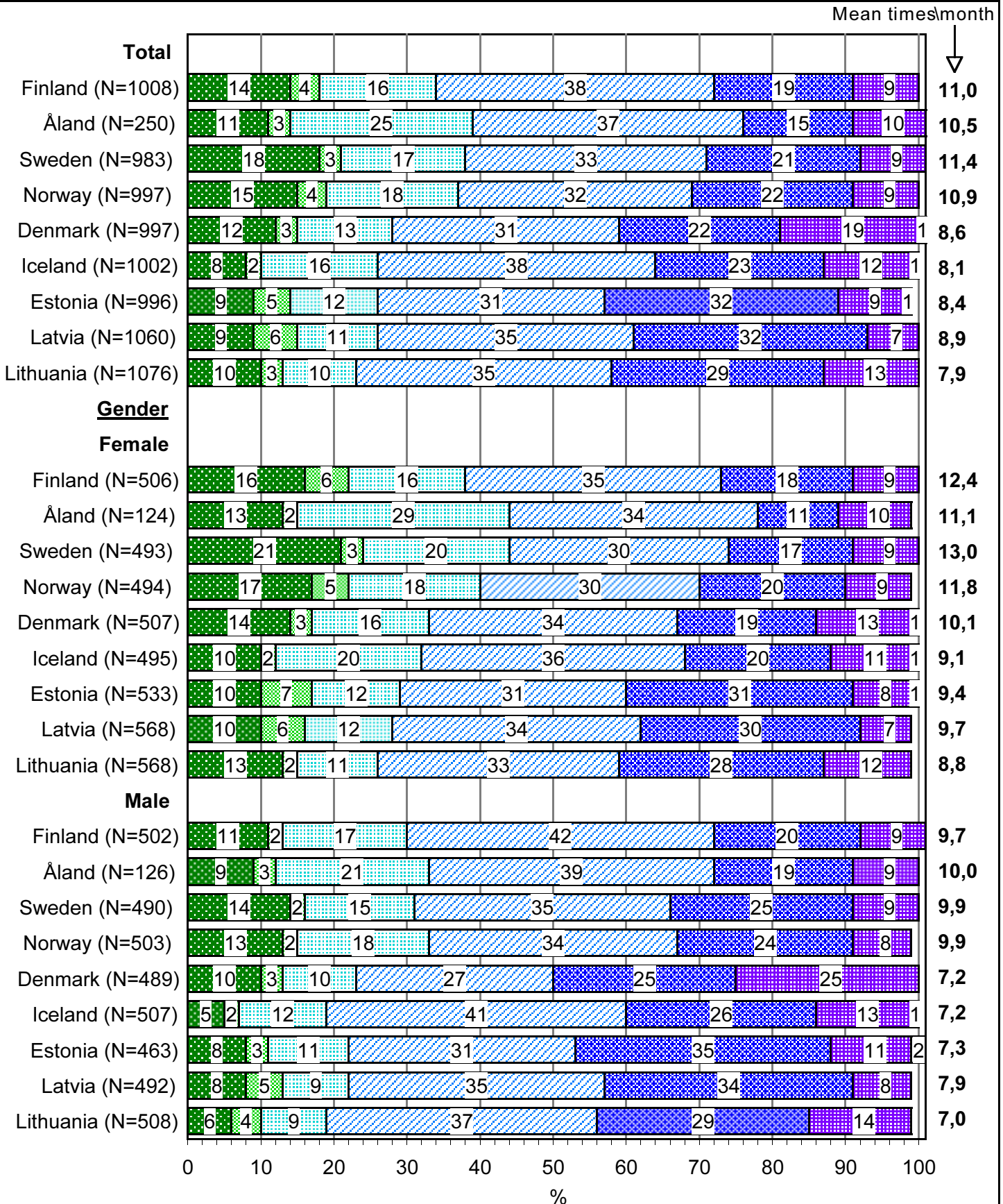


Frequency of eating different fruits and berries

A Figure 36

CITRUS FRUITS

N=total weighted

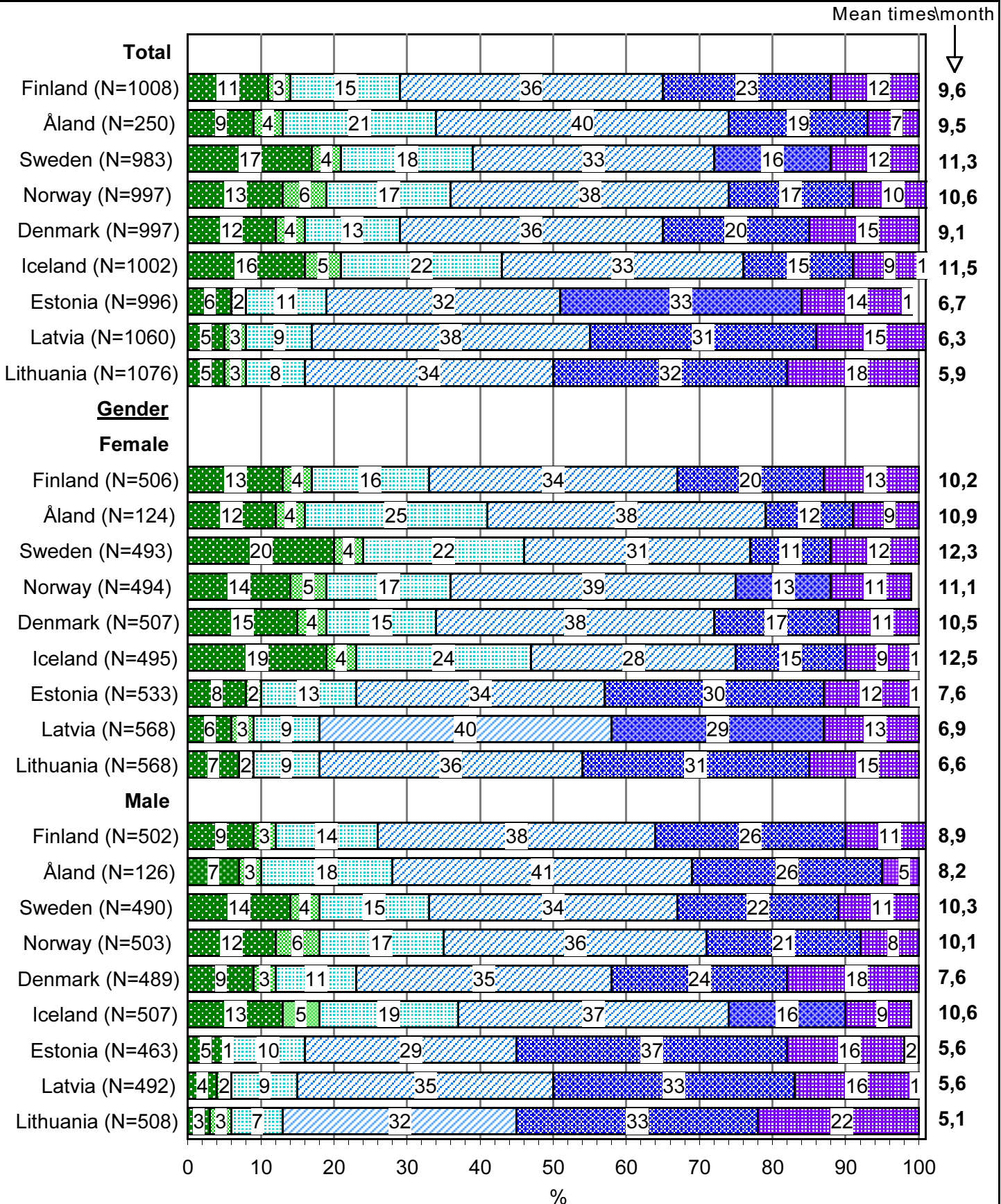


Frequency of eating different fruits and berries

A Figure 37

BANANA

N=total weighted

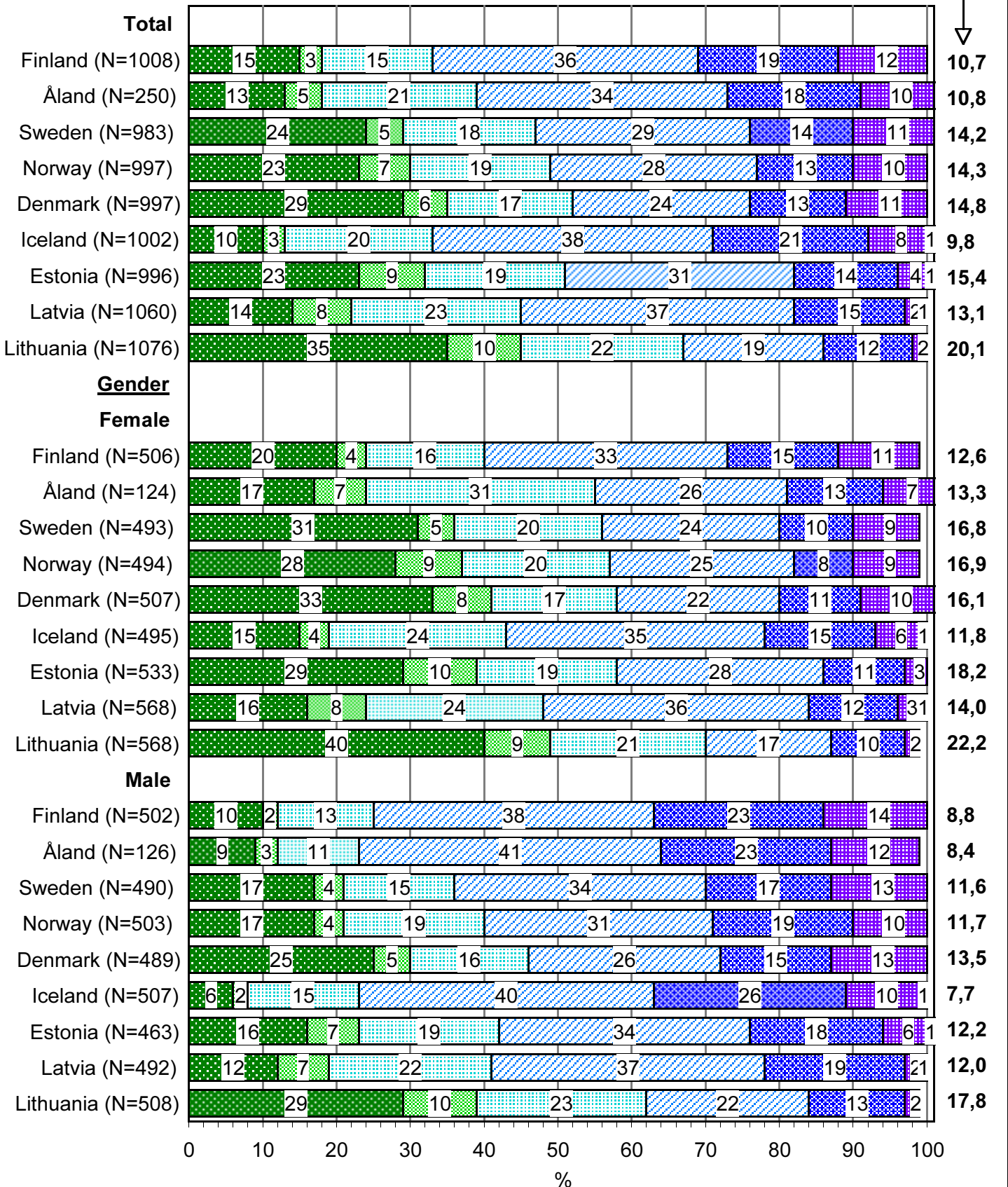


APPLE

N=total weighted



Mean times/month



Frequency of eating different fruits and berries

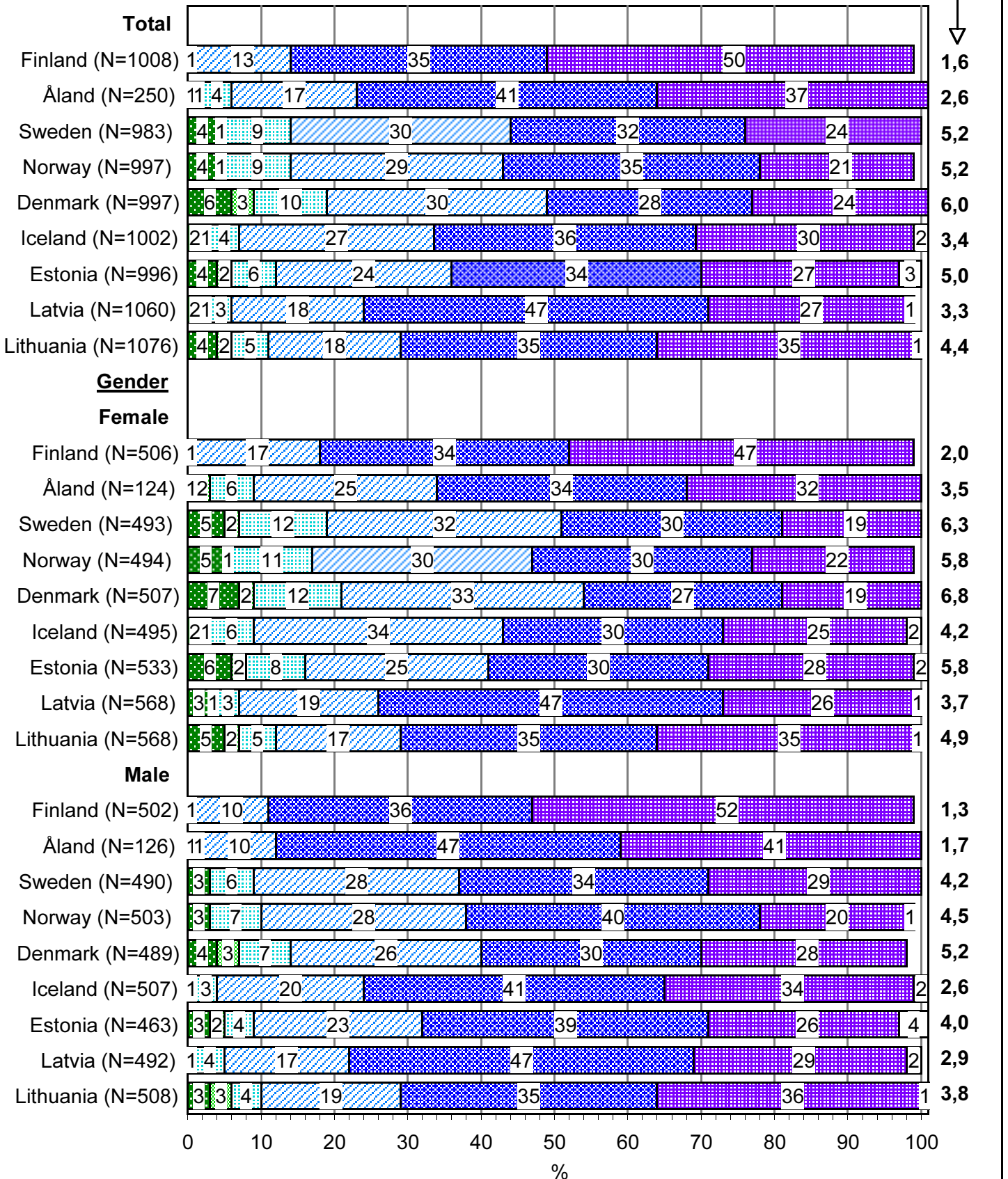
A Figure 39

PEAR

N=total weighted



Mean times/month

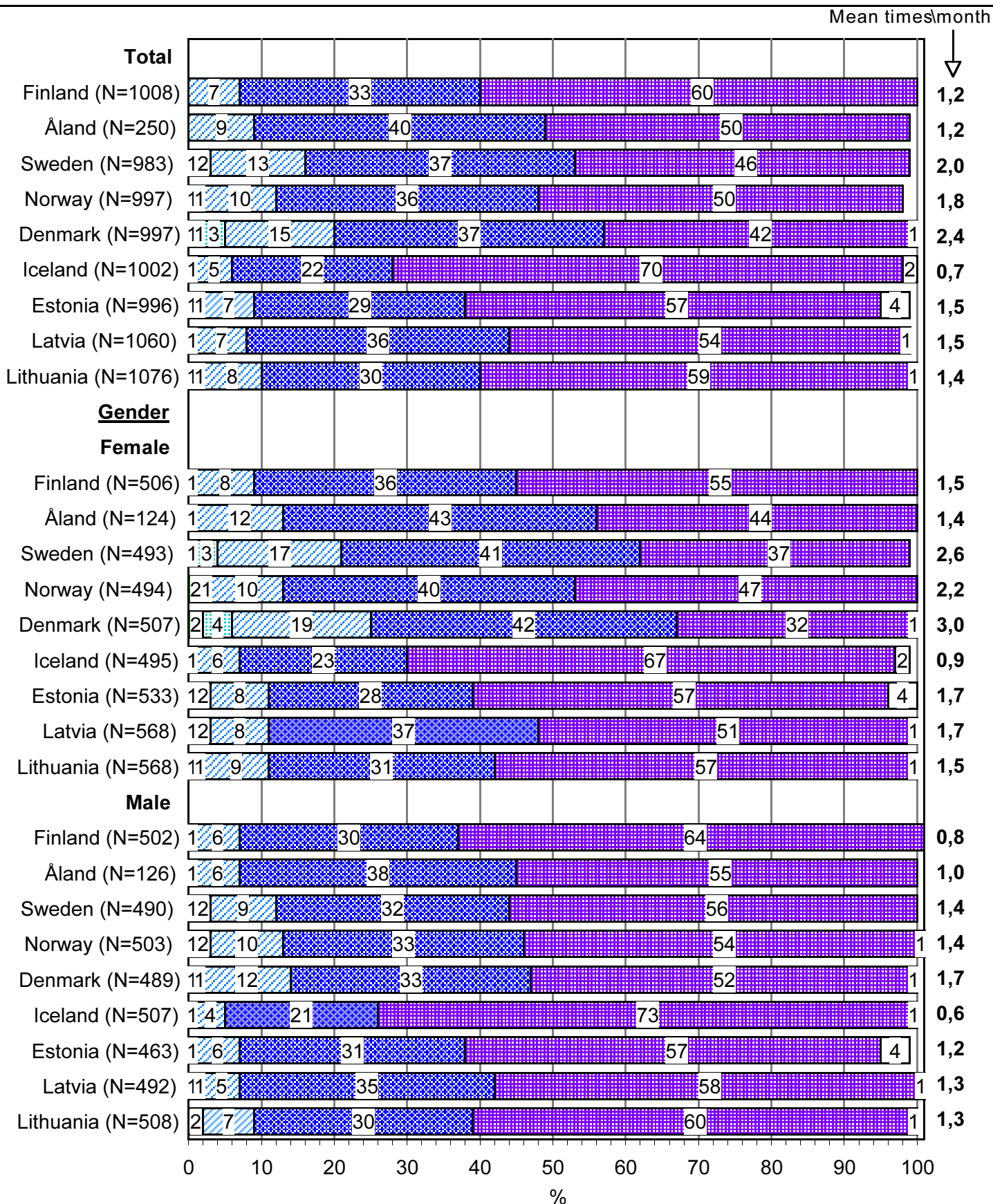


Frequency of eating different fruits and berries

PEACH, NECTARINE, APRICOT

A Figure 40

N=total weighted



Frequency of eating different fruits and berries

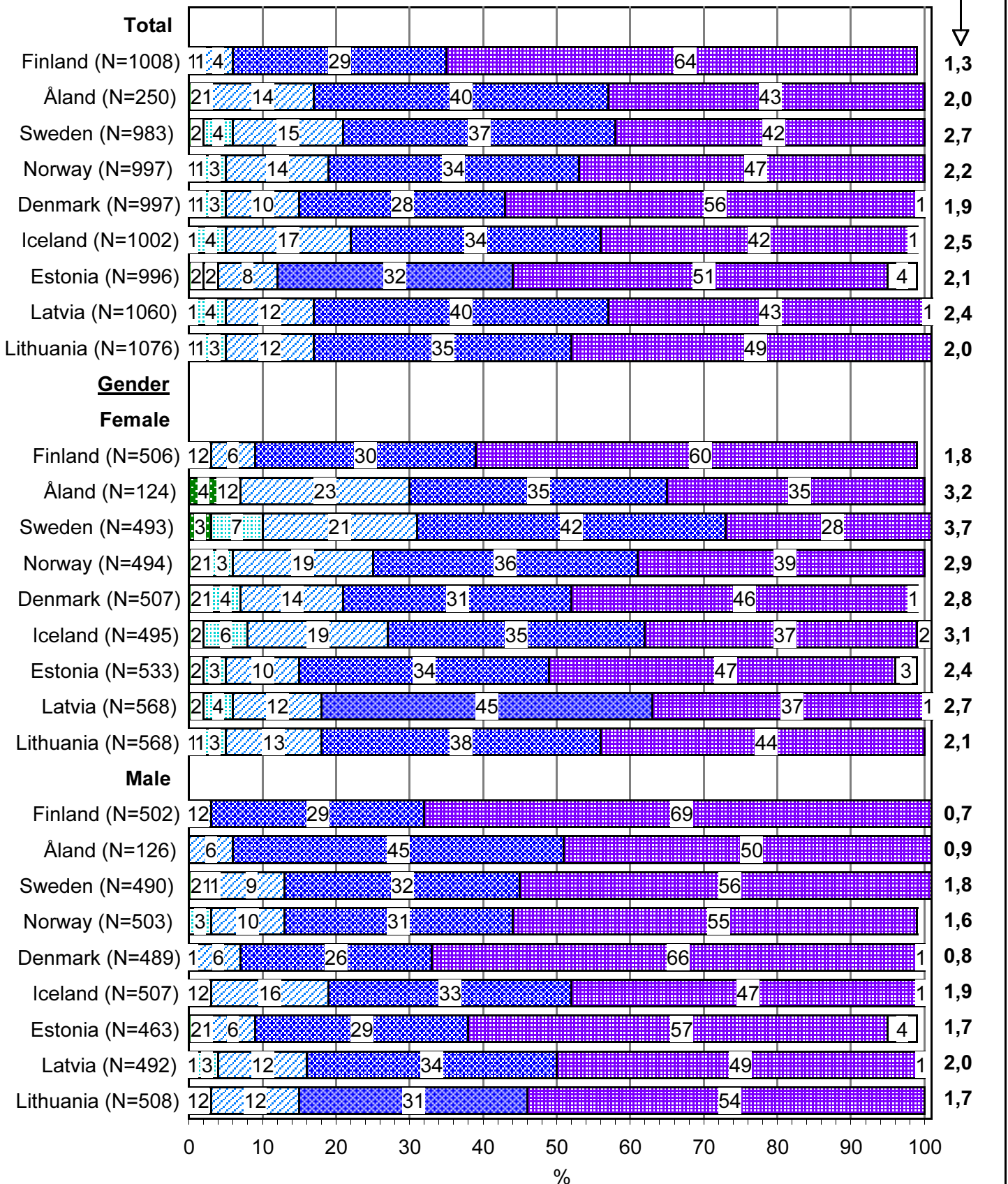
A Figure 41

KIWI

N=total weighted



Mean times/month

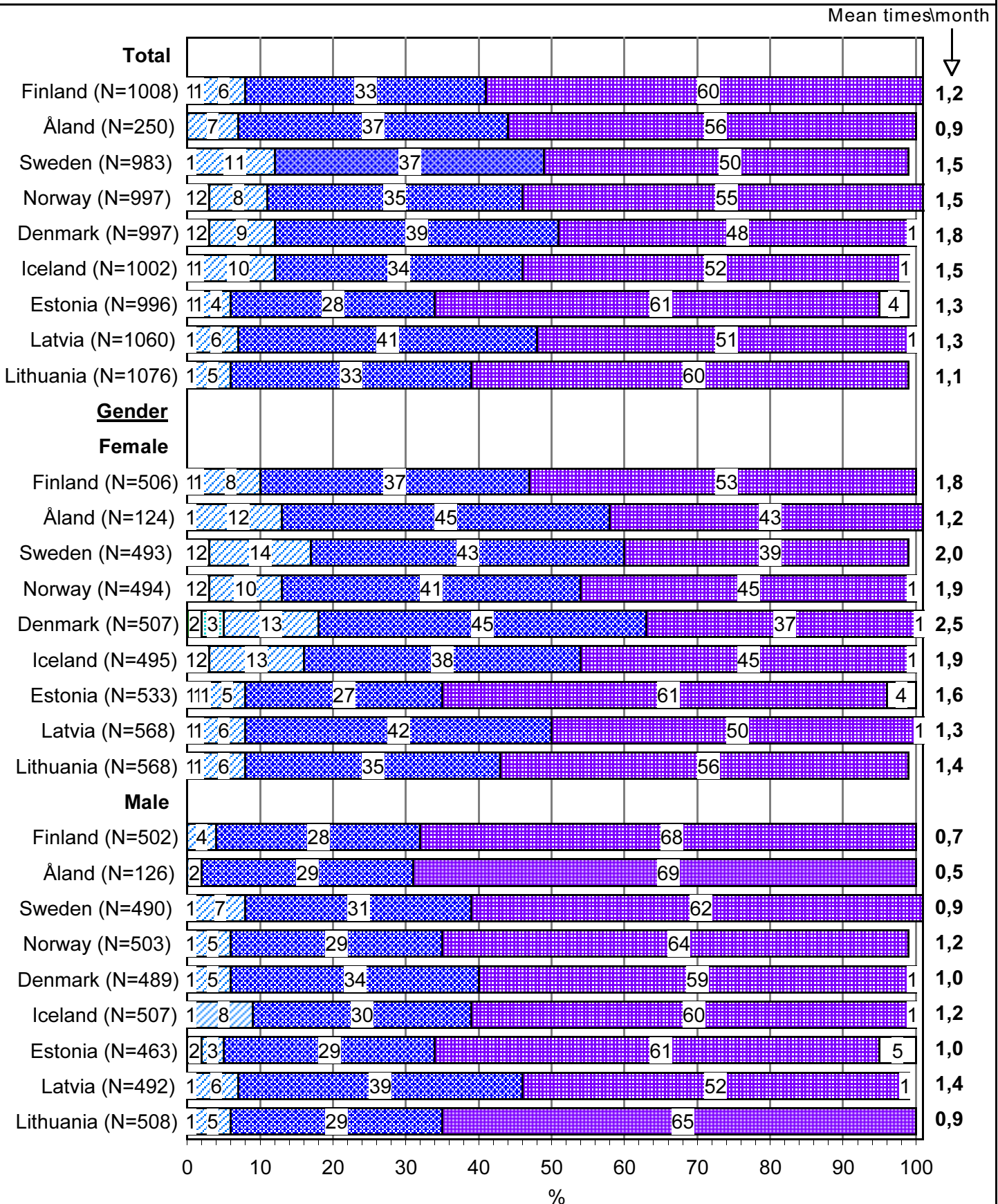


Frequency of eating different fruits and berries

A Figure 42

MELONS

N=total weighted



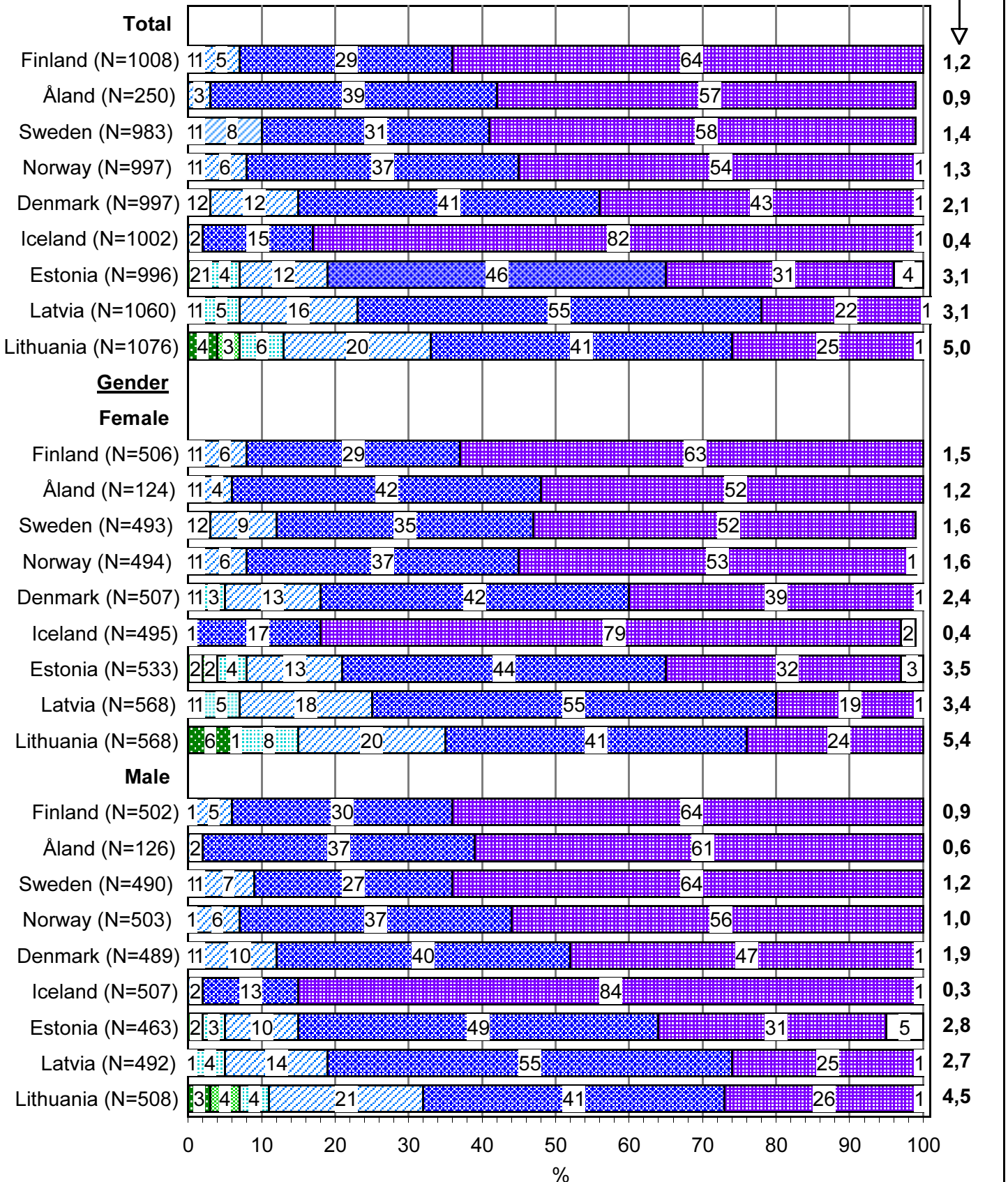
Frequency of eating different fruits and berries PLUMS, CHERRIES

A Figure 43

N=total weighted



Mean times/month



Frequency of eating different fruits and berries

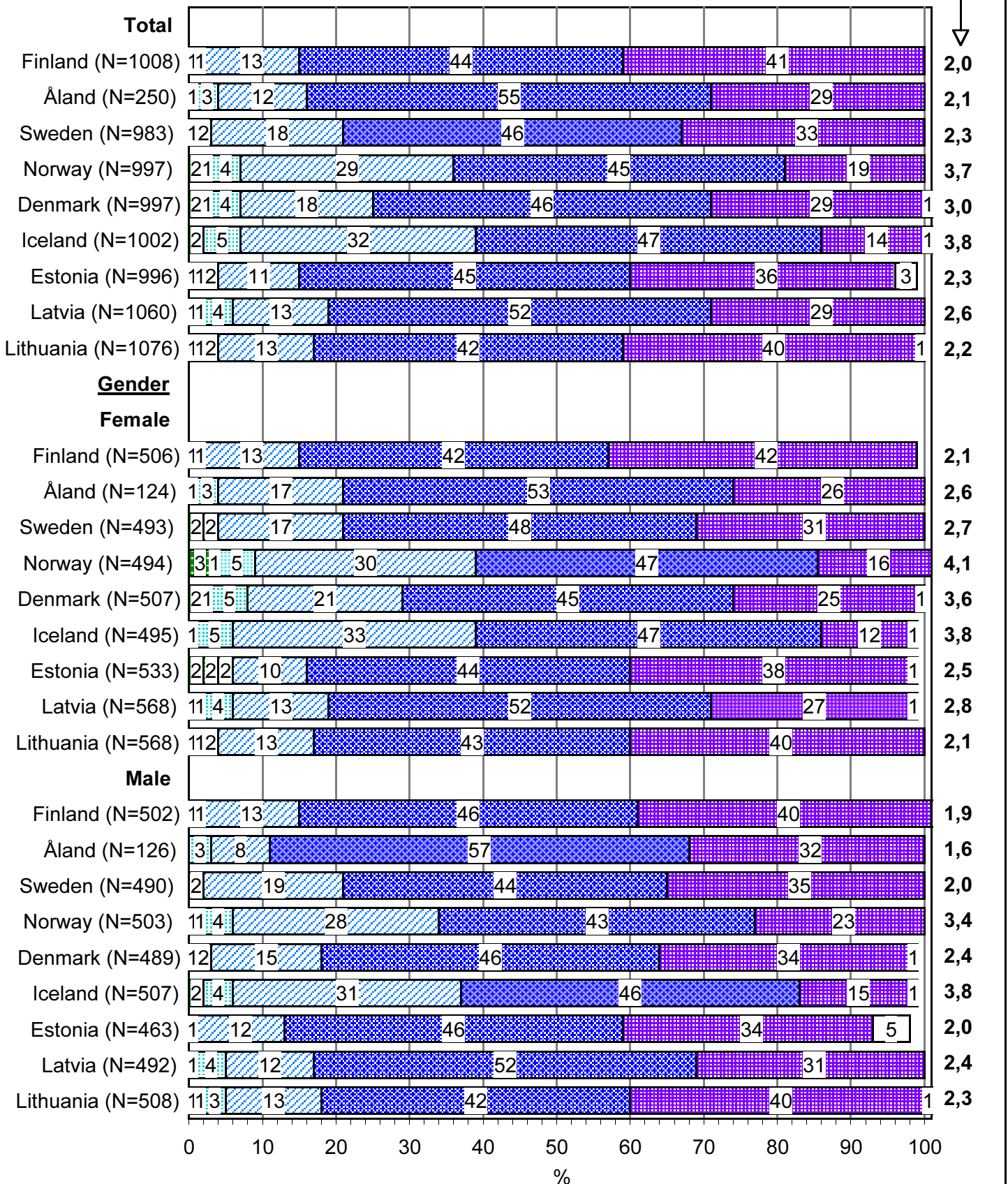
A Figure 44

GRAPES

N=total weighted



Mean times/month



Frequency of eating different fruits and berries

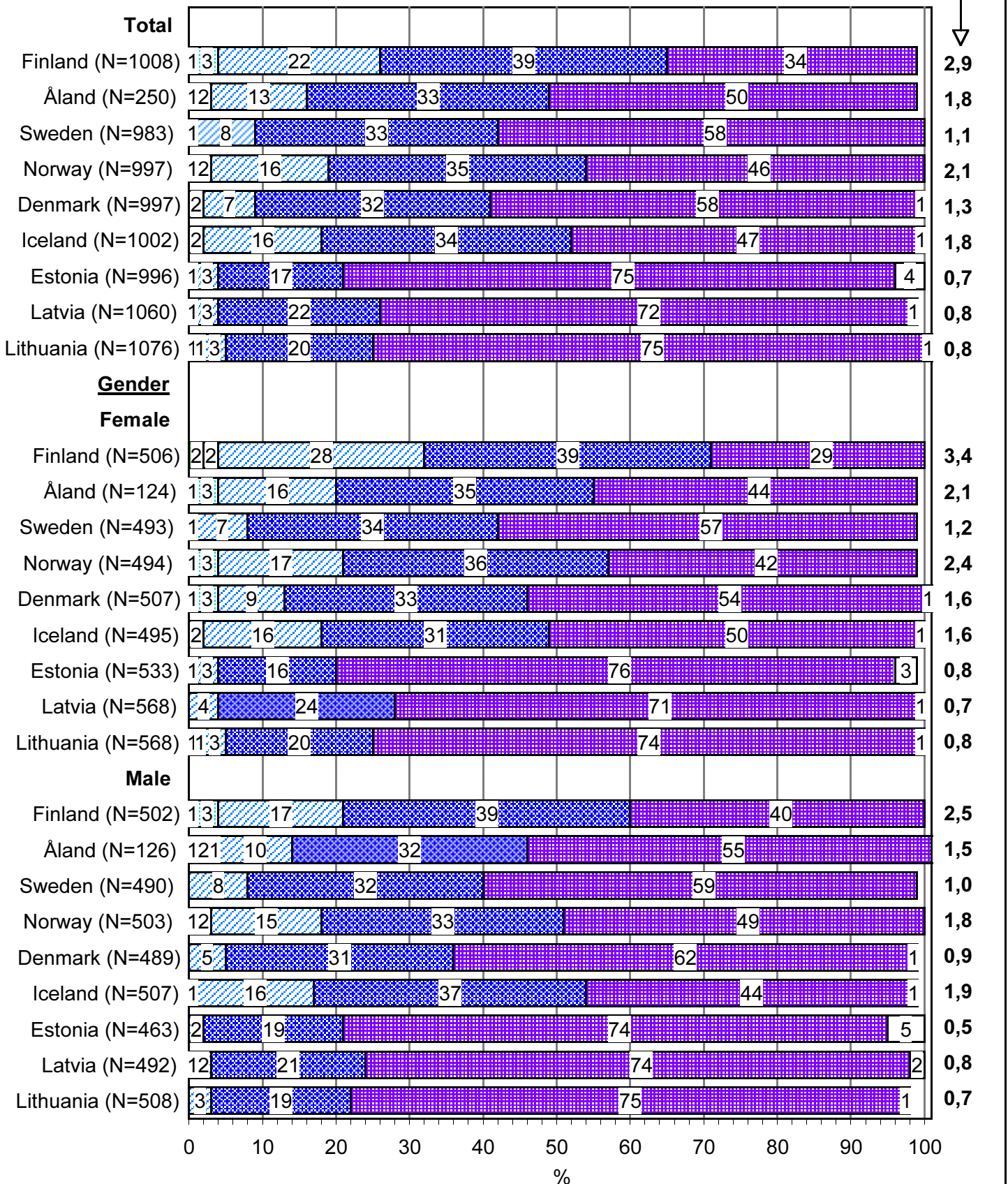
A Figure 45

PINEAPPLE

N=total weighted



Mean times/month

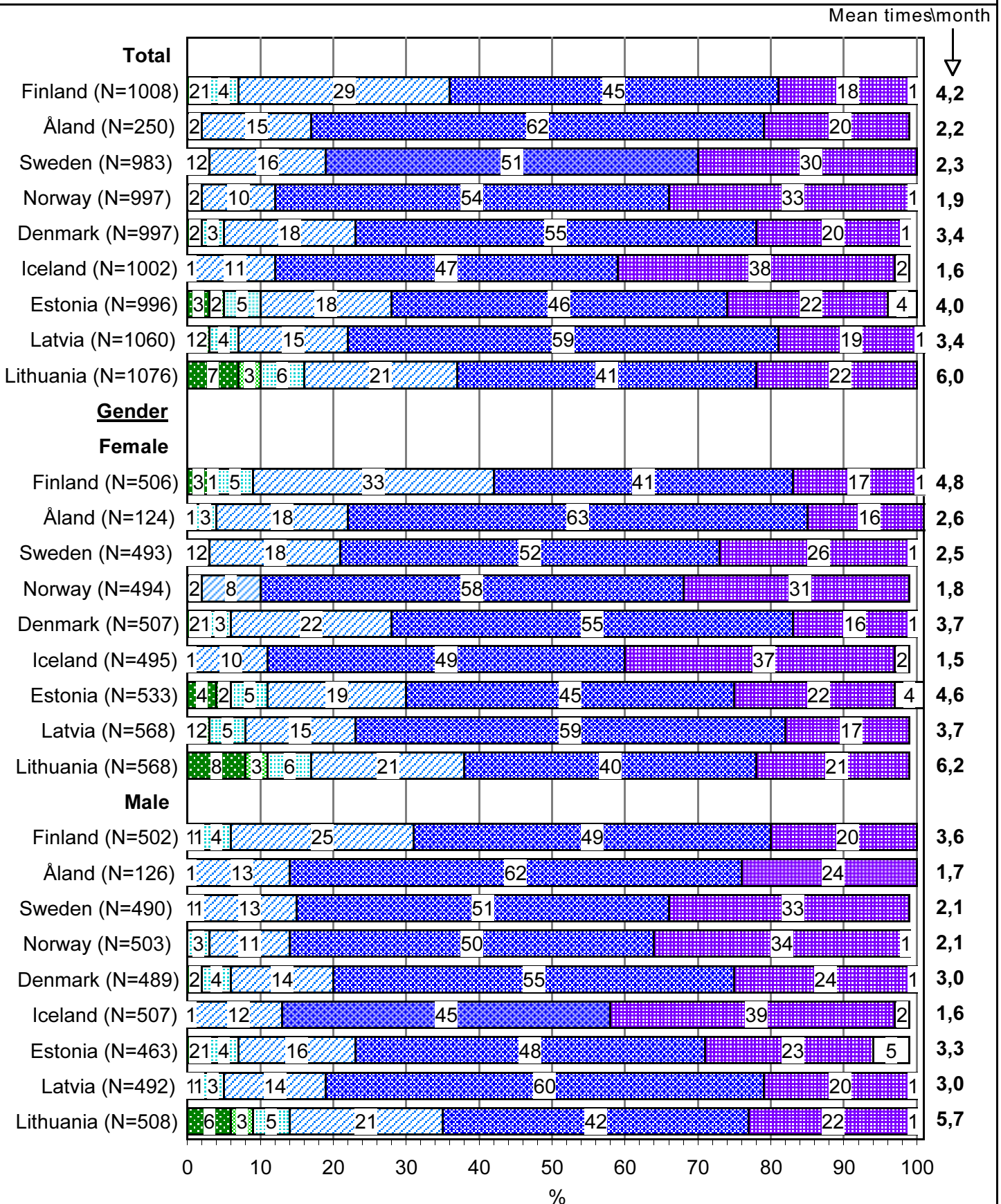


Frequency of eating different fruits and berries

A Figure 46

STRAWBERRIES

N=total weighted



Frequency of eating different fruits and berries

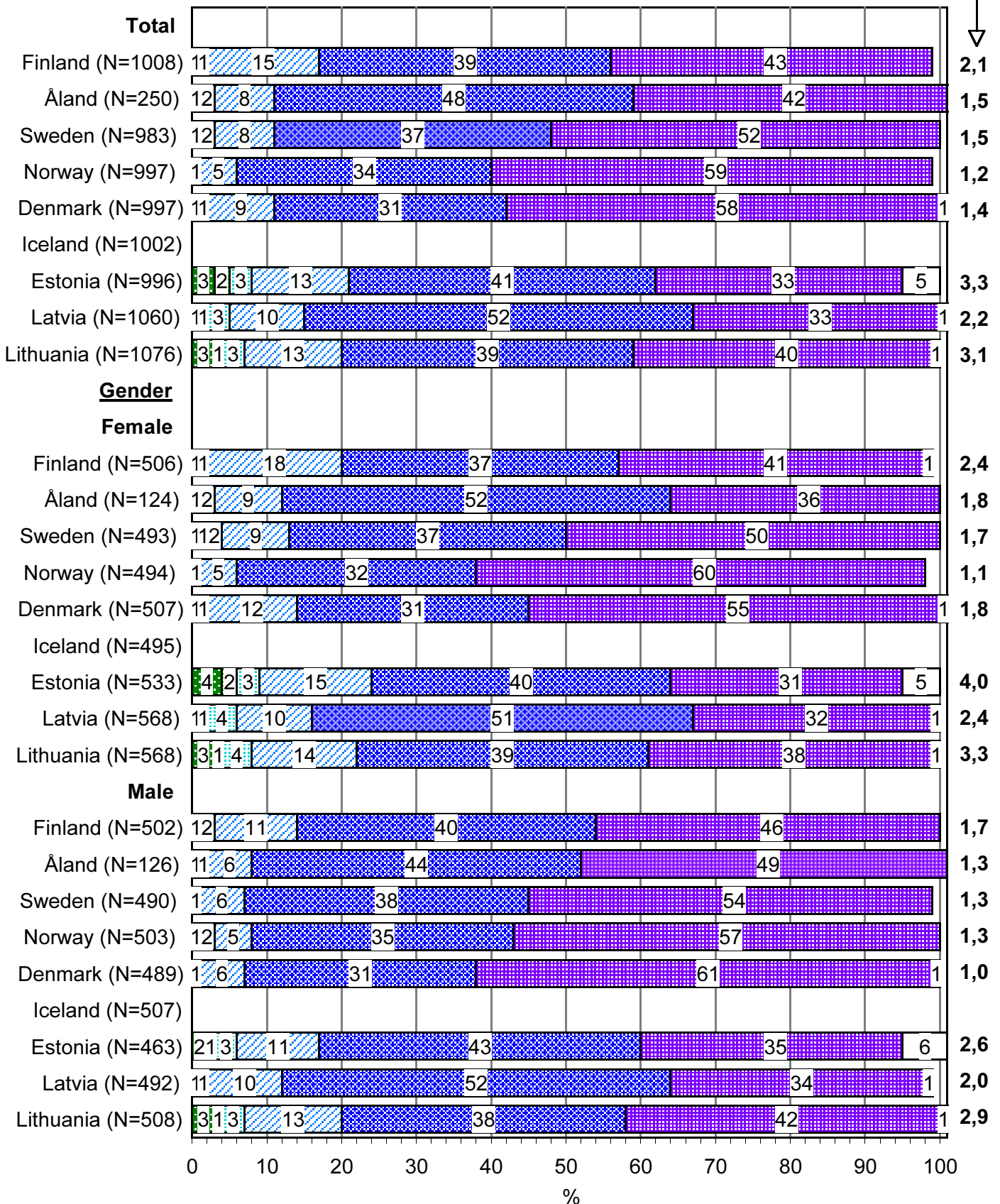
RASPBERRIES, BLACKBERRIES

A Figure 47

N=total weighted



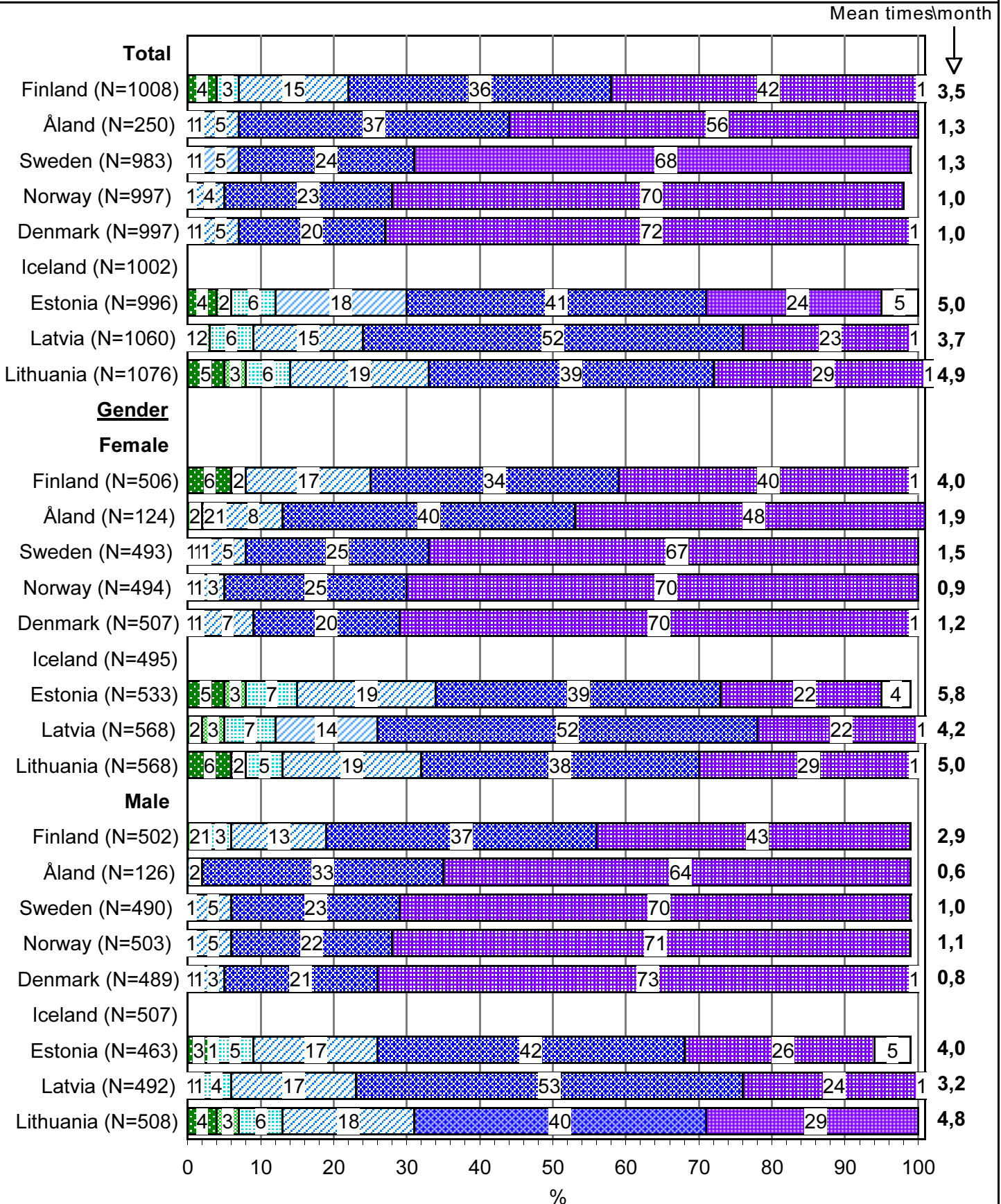
Mean times/month



Frequency of eating different fruits and berries CURRANTS, GOOSEBERRIES

A Figure 48

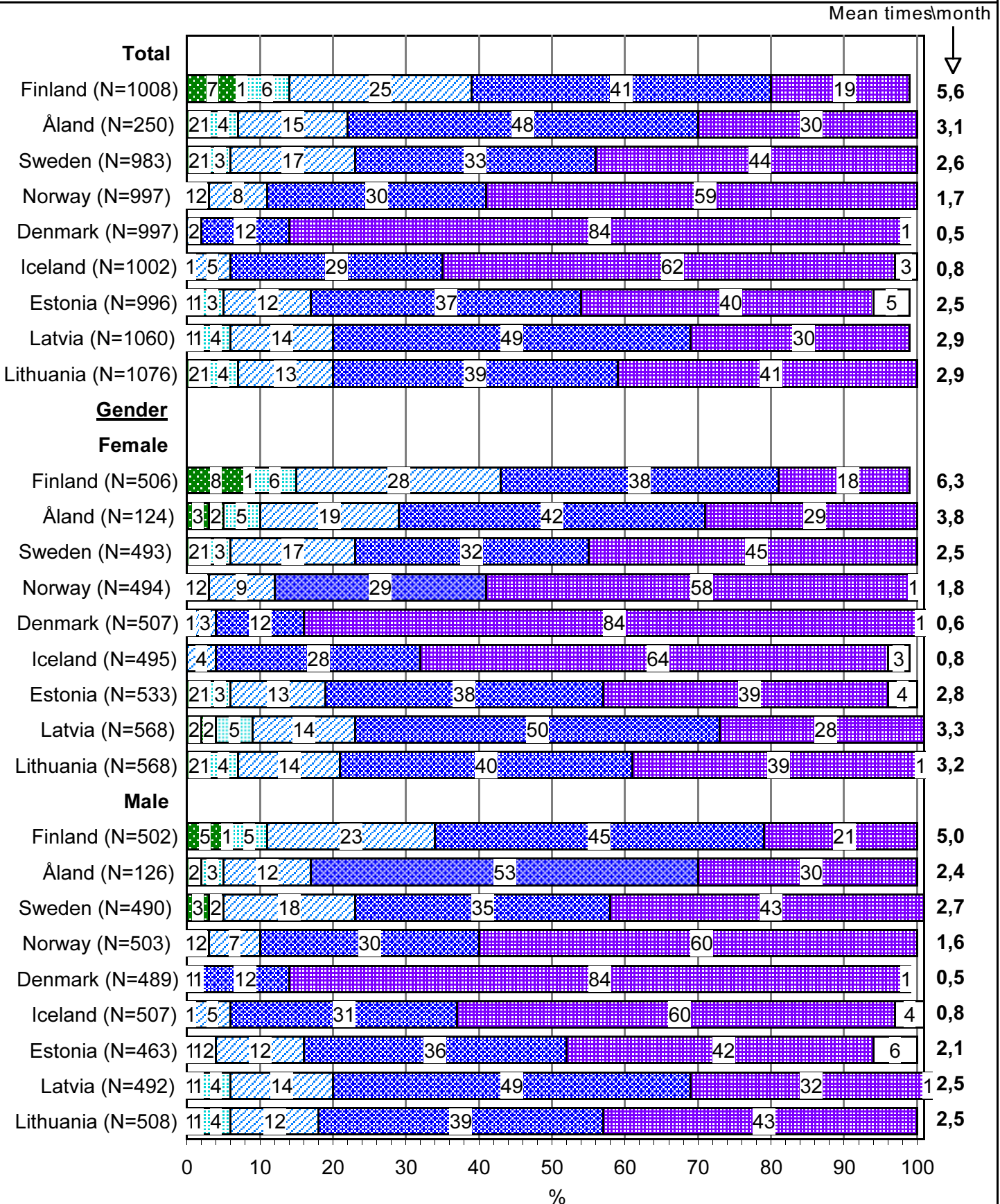
N=total weighted



Frequency of eating different fruits and berries BLUEBERRIES, LINGONBERRIES, CRANBERRIES

A Figure 49

N=total weighted

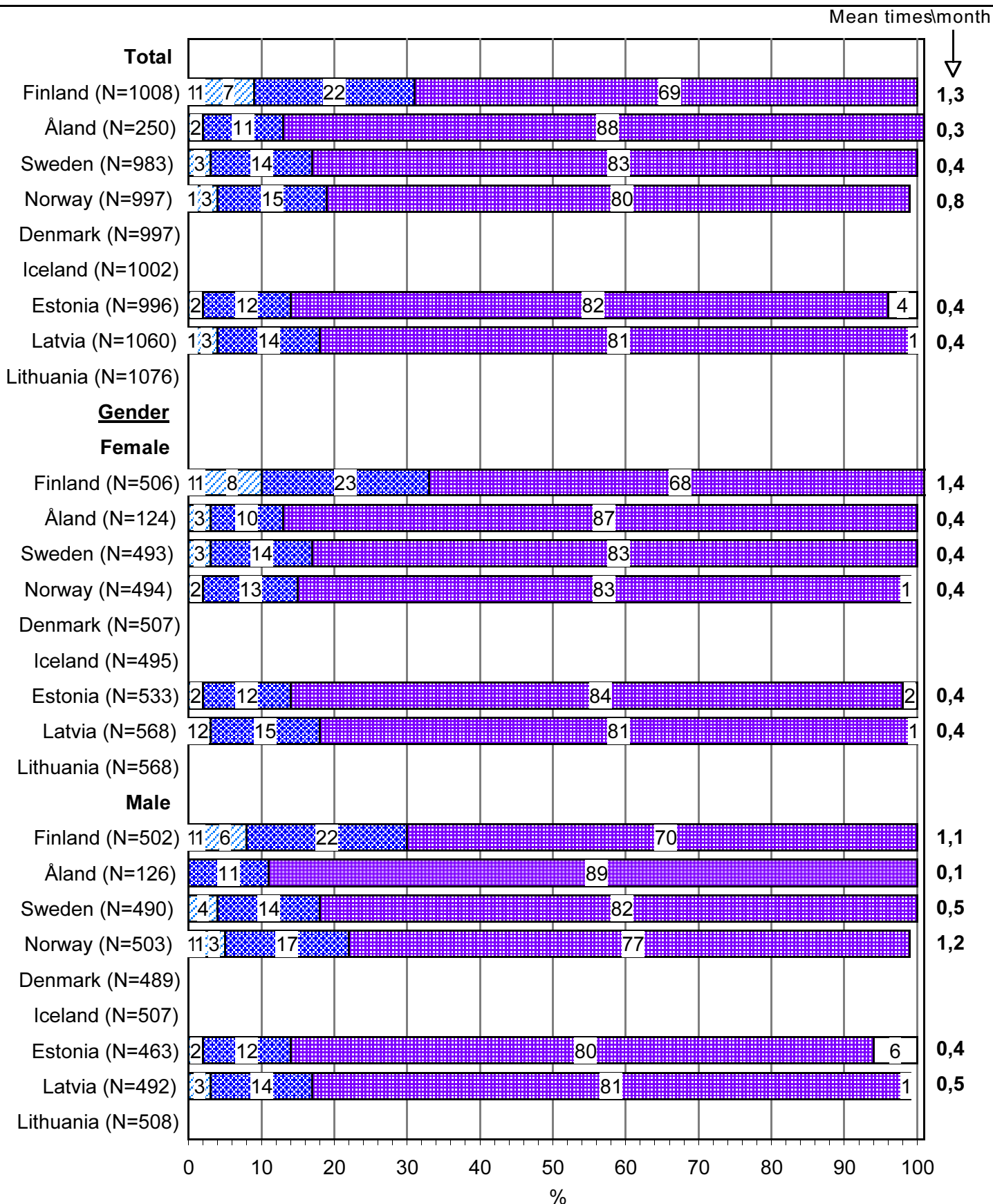


Frequency of eating different fruits and berries

A Figure 50

CLOUDBERRIES

N=total weighted



Frequency of eating different fruits and berries

A Figure 51

MANGO, PAPAYA

N=total weighted

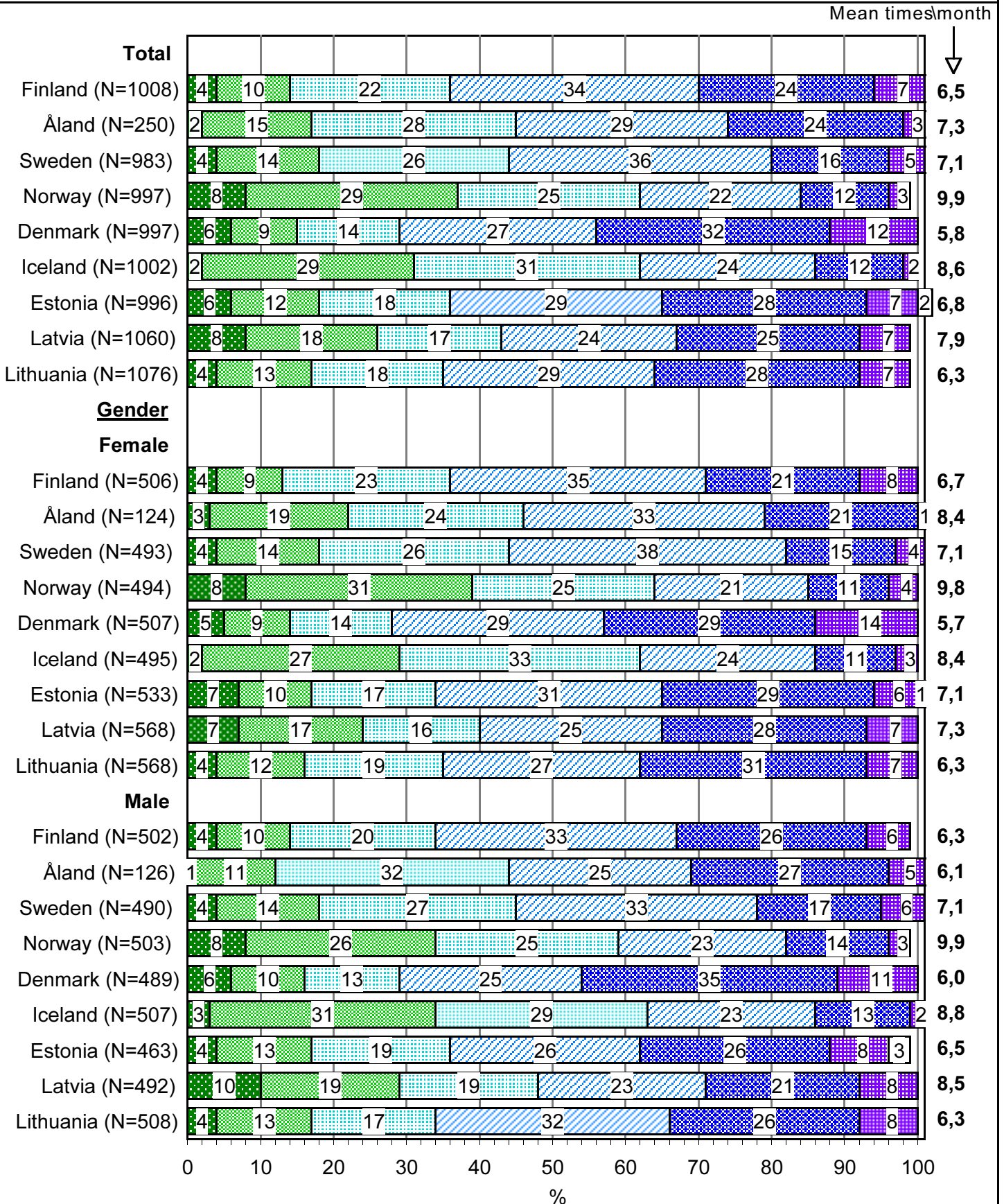


Frequency of eating fish and shellfish

FISH/SHELLFISH, ALL TYPES TOTAL

A Figure 52

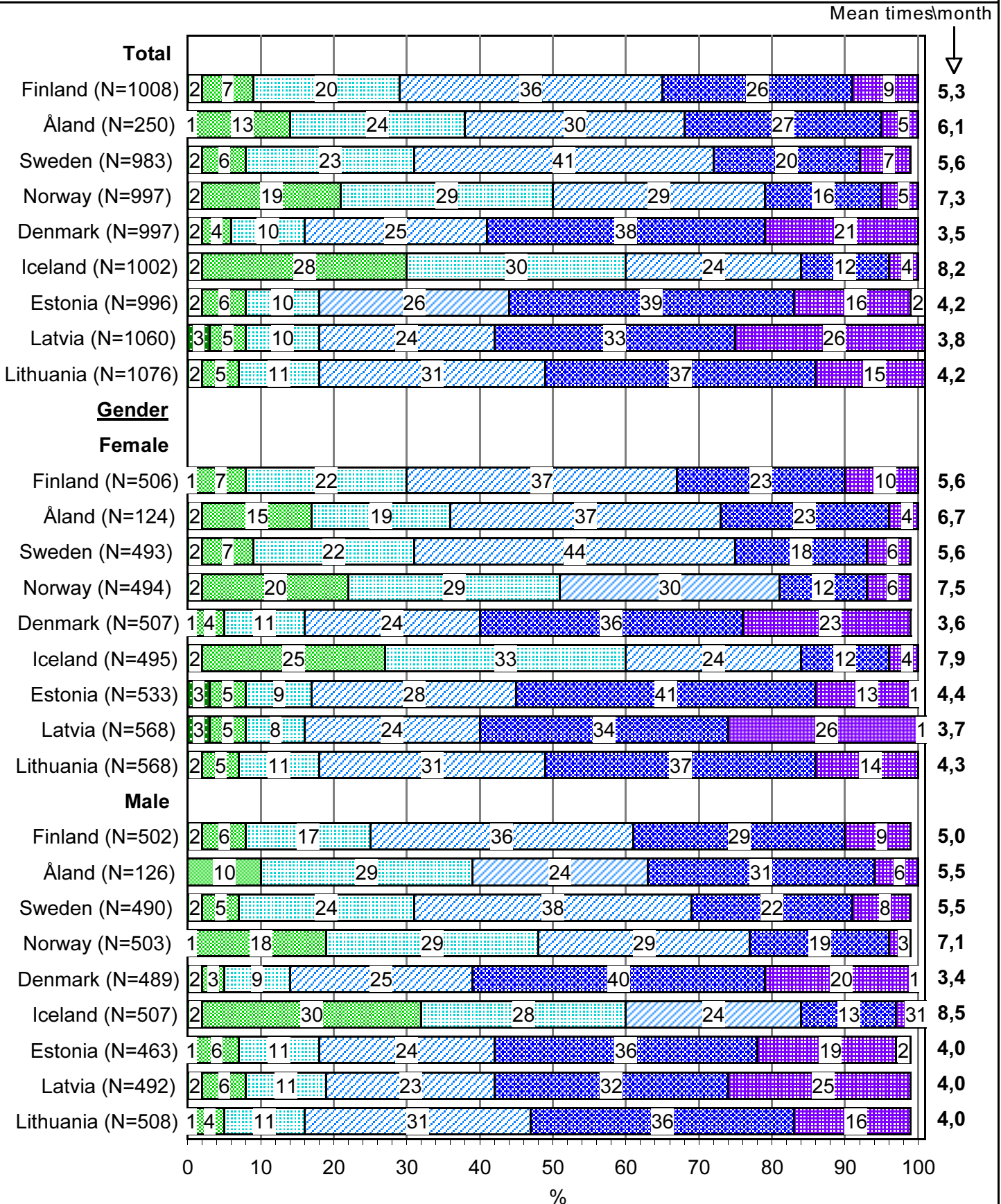
N=total weighted



Frequency of eating fish and shellfish FISH/SHELLFISH AS A MAIN DISH

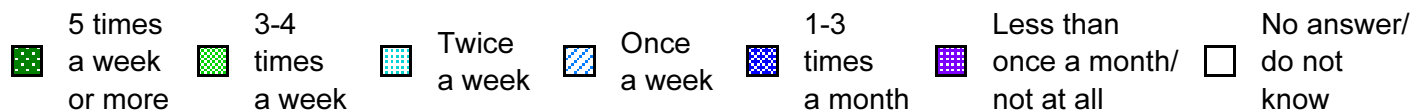
A Figure 53

N=total weighted

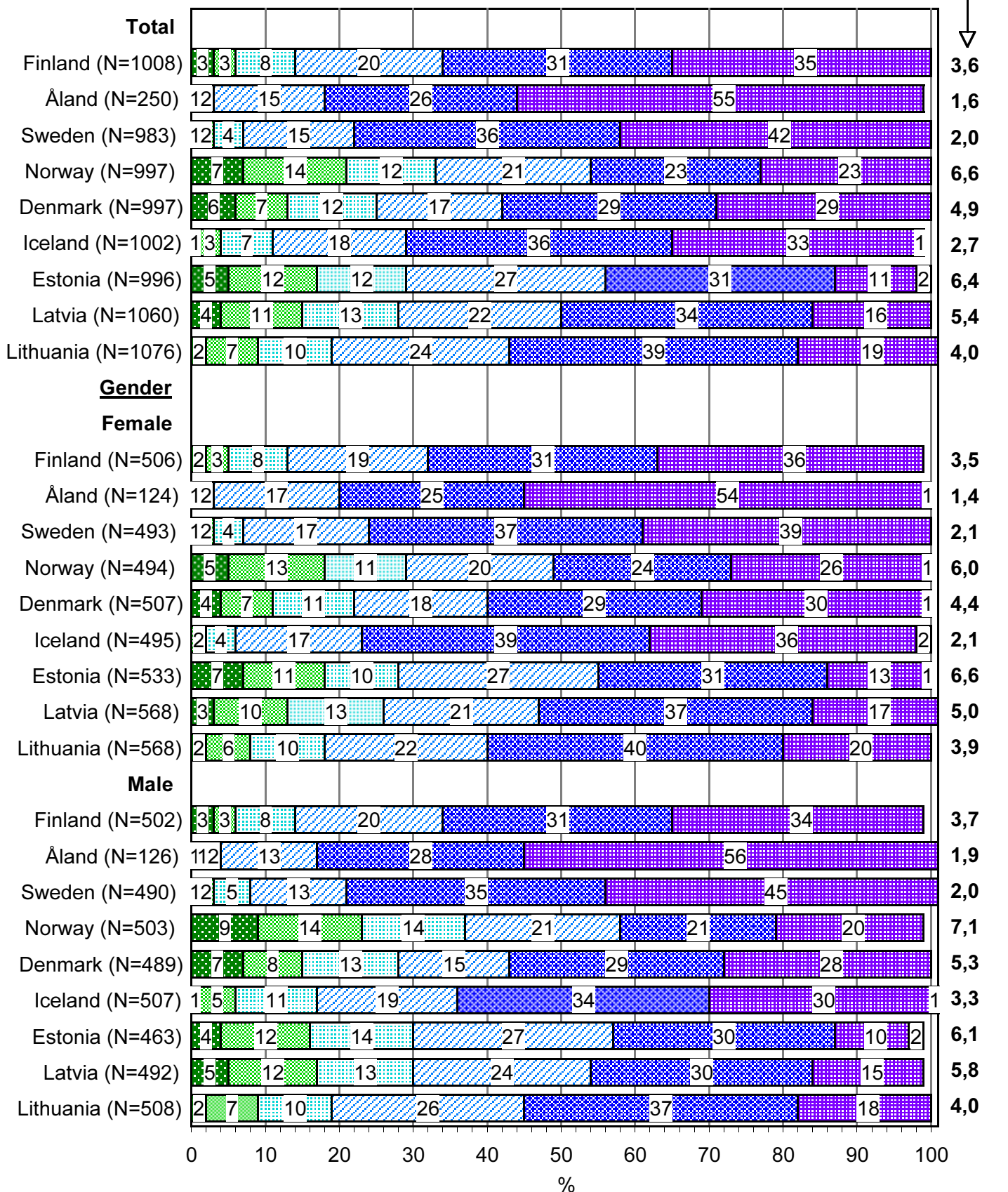


Frequency of eating fish and shellfish FISH/SHELLFISH AS A SIDE DISH, OR ON A SANDWICH OR IN SALAD

N=total weighted



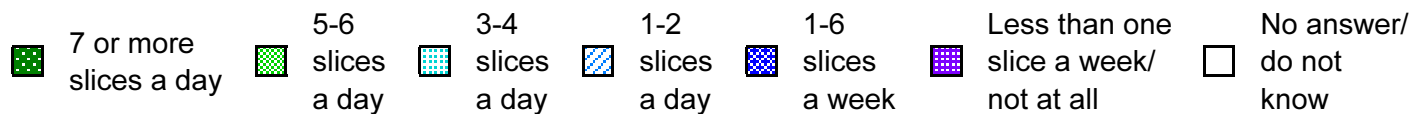
Mean times/month



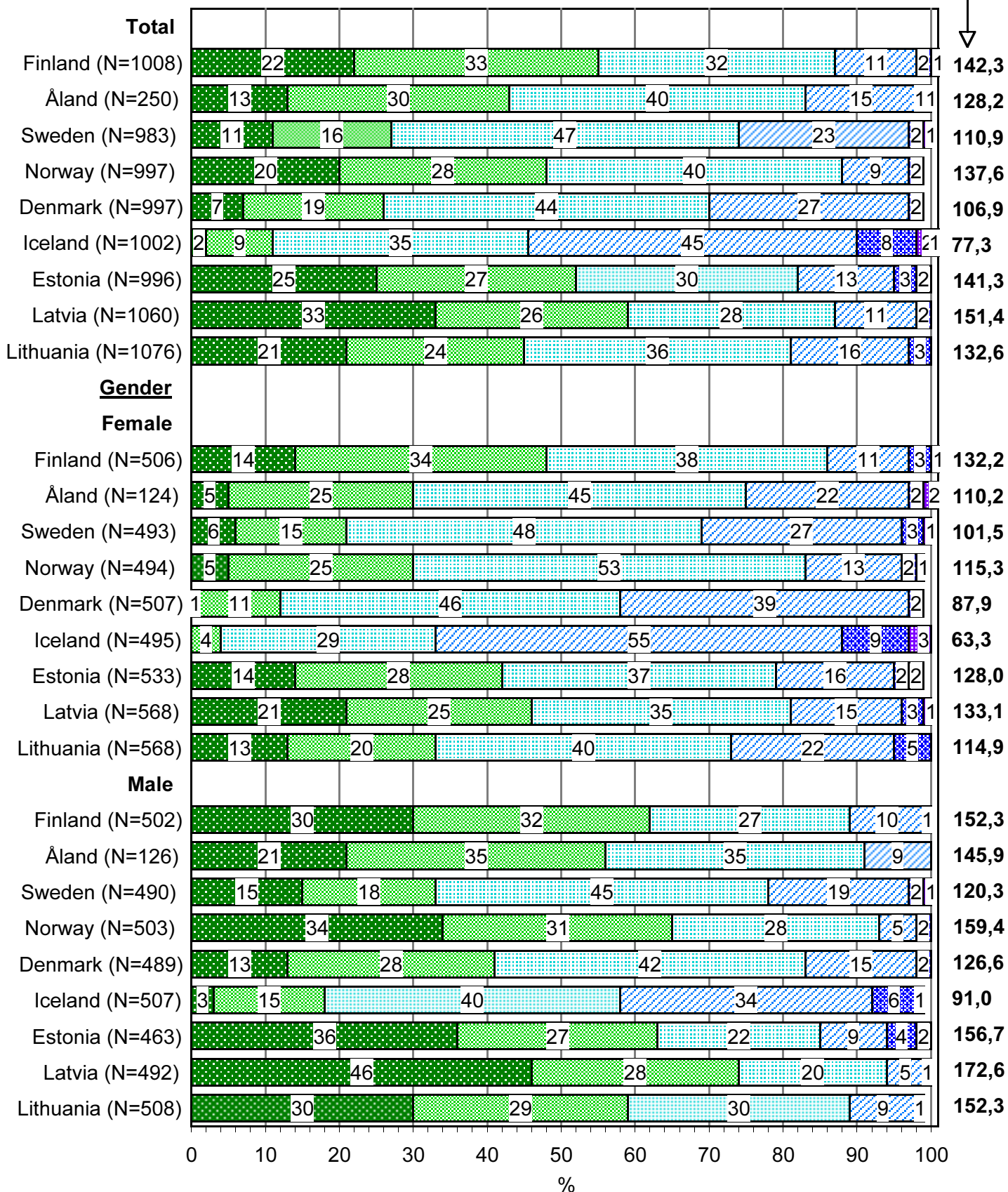
Consumption of bread ALL TYPES, TOTAL

A Figure 55

N=total weighted



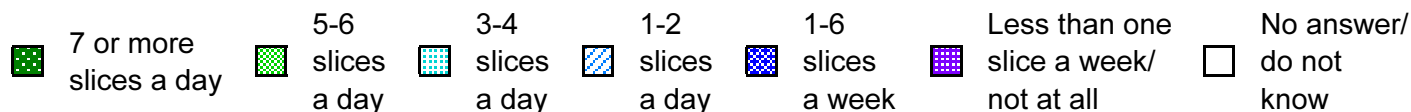
Mean times/month



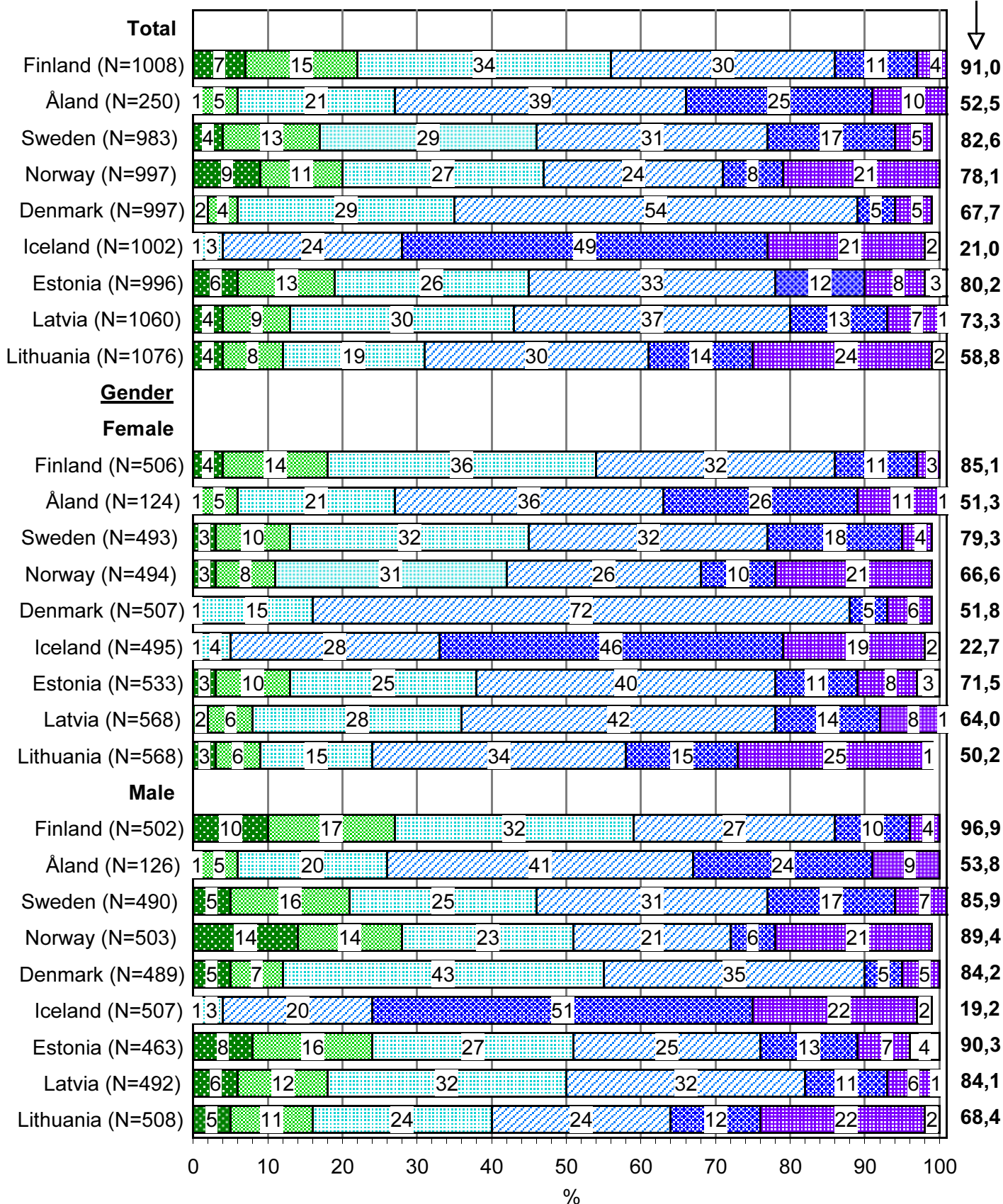
Consumption of bread

NATIONAL BREADS: FIBER CONTENT >6g/100g

N=total weighted

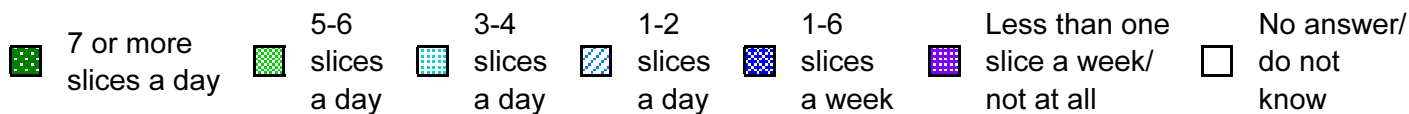


Mean times/month

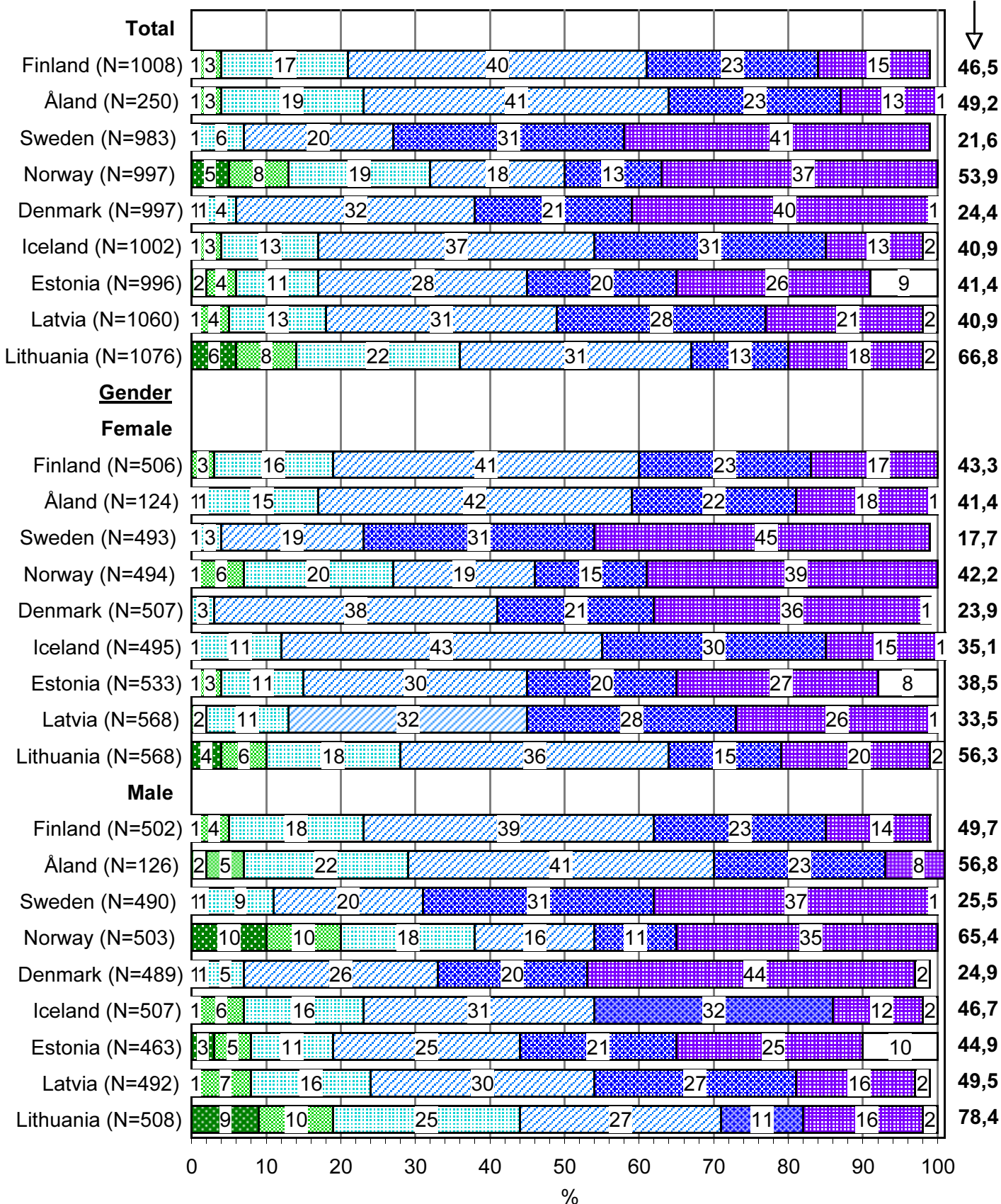


Consumption of bread NATIONAL BREADS: FIBER CONTENT 3-6g/100g

N=total weighted



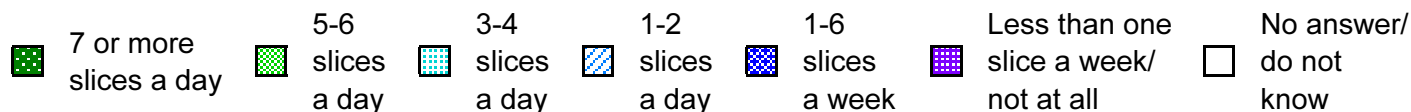
Mean times/month



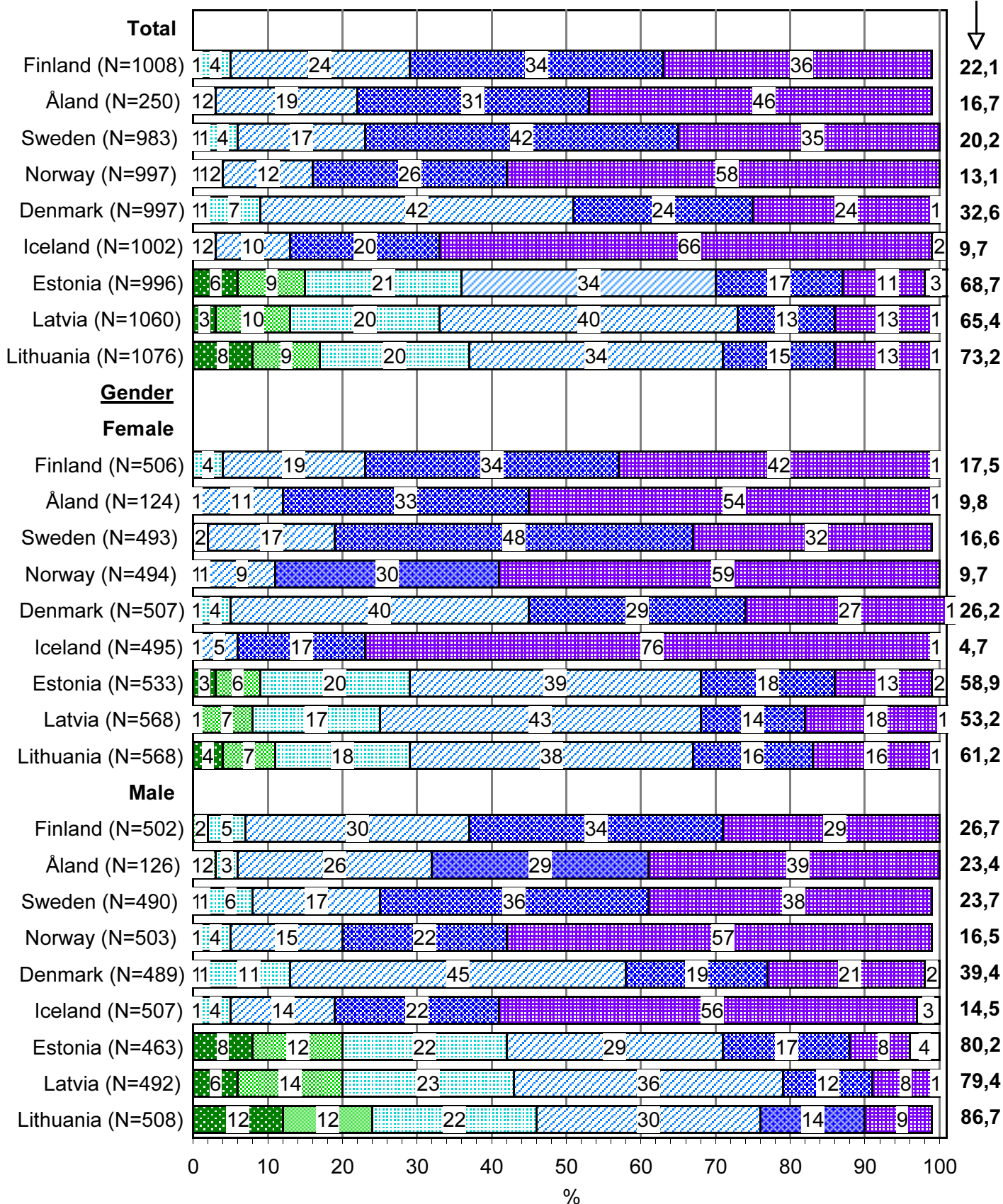
Consumption of bread

NATIONAL BREADS: FIBER CONTENT <3g/100g

N=total weighted



Mean times/month



NorBaGreen -Project

Questionnaire

Instructions for Respondent

Please answer the questions by ticking off the appropriate alternative or by writing the answer into the reserved space. Read the questions carefully before answering. Please check off only one alternative for each question.

The intake of vegetables, roots, fruit and berries can vary from day to day and between different seasons. In answering the questions please consider how often you have been eating them *on average* during the last year.

Please omit those eating occasions when the portion was well under one normal portion (e.g. one slice of cucumber on a sandwich, a little piece of parsley as a decoration, etc).

Example:

How often do you usually eat the following foods? (Think about last year when answering the questions.)

Fruit and berries

For example, if you have eaten fruit and berries on average five times a week throughout the year, you should tick off the alternative “fruit and berries of all sorts” “5 times a week” in the shaded top row. Then you should fill in how often you usually eat particular kinds of fruit and berries.

		Times a month			Times a week						Times a day				
		<1)	1	2	3	1	2	3	4	5	6	1	2	3	4 or more
301	Fruit and berries of all sorts, total (fresh, frozen, cooked, canned, fruit juice or berry juice etc)									X					
302	Fresh or frozen fruit or berries, mashed fruit or berries							X							
303	Canned fruit or berries, cooked fruit or berries					X									
304	Fruit juice or berry juice (not steamed juices)					X									
305	Dried fruit or dried berries	X													

*) Less frequently than once a month, or not at all

A) How often do you usually eat the following foods?

(Think about the last year when answering the questions. Please omit those eating occasions when the portion was well under one normal portion (e.g. one slice of cucumber on a sandwich, a little piece of parsley as a decoration, etc).)

1. Vegetables and roots

Vegetables and roots include cucumber, carrot, cabbage, broccoli, tomato, lettuce, peas, beans, lentils, etc. Also take into account vegetable or root containing dishes, e.g. vegetable/root soup, vegetable/root juice, vegetable/root containing stews, or salads. **Please omit potatoes, fruit and berries, because we will ask about them in the next questions.**

		Times a month				Times a week						Times a day			
		<1)	1	2	3	1	2	3	4	5	6	1	2	3	4 or more
101	Vegetables and roots, all types total (fresh, frozen, canned, cooked, stewed, vegetable or root juice, etc.)														
102	Fresh vegetables or roots, salad, grated fresh vegetables or roots														
103	Vegetables or roots on bread														
104	Cooked, canned or steamed vegetables or roots														
105	Fried or wok vegetables or roots														
106	Vegetable or roots dishes (vegetable soups, vegetable stews etc)														
107	Vegetable or roots juice														

*) Less frequently than once a month, or not at all

2. Potatoes

		Times a month				Times a week						Times a day			
		<1)	1	2	3	1	2	3	4	5	6	1	2	3	4 or more
201	Potatoes, all types, total (boiled, fried, mashed, etc.)														
202	Boiled or baked potatoes														
203	Mashed potatoes														
204	Fried potatoes, French fries														

*) Less frequently than once a month, or not at all

3. Fruit and berries

(Please omit highly sugared fruit or berry jam and marmalade)

		Times a month				Times a week						Times a day			
		<1 *)	1	2	3	1	2	3	4	5	6	1	2	3	4 or more
301	Fruit and berries of all sorts, total (fresh, frozen, cooked, canned, fruit juice or berry juice, etc.)														
302	Fresh or frozen fruit or berries, mashed fruit or berries														
303	Canned fruit or berries, cooked fruit or berries														
304	Fruit juice or berry juice (not steamed juices)														
305	Dried fruit or dried berries														

*) Less frequently than once a month, or not at all

4. Fish and shellfish

		Times a month				Times a week						Times a day			
		<1 *)	1	2	3	1	2	3	4	5	6	1	2	3	4 or more
401	Fish or shellfish, all types, total														
402	Fish or shellfish as a main dish														
403	Fish or shellfish as a side dish, on a sandwich or in salad (canned fish, salt fish, smoked fish etc.)														

*) Less frequently than once a month, or not at all

B) How often do you usually eat *different* vegetables, roots, fruit or berries?

(Think about the last year when answering the questions. Please omit those eating occasions when the portion was well under one normal portion (e.g. one slice of cucumber on a sandwich, a little piece of parsley as a decoration, etc).)

6. Vegetables and roots (Please take into account both fresh and processed vegetables and roots and also vegetables and roots in dishes, but omit juices and highly sugared jam and marmalade)

		Times a month				Times a week						Times a day			
		<1 *)	1	2	3	1	2	3	4	5	6	1	2	3	4 or more
601	Carrot														
602	Rutabaga, turnip, parsnip, root parsley														
603	Red beet														
604	Cabbage (e.g. white cabbage, red cabbage, kohlrabi)														
605	Cauliflower														
606	Broccoli, brussel sprouts														
607	Green salad (e.g. lettuce, chinese cabbage, rucola salad)														
608	Tomato														
609	Cucumber														
610	Sweet pepper														
611	Spinach														
612	Avocado														
613	Radish, black radish														
614	Pumpkin, marrow/zucchini, aubergine, courgettes														
615	Rhubarb														
616	Onion, leek, garlic (e.g. as soup, salad, pie, as side dish)														
617	Peas, corn, mixed vegetables (fresh or frozen)														
618	Foods prepared of dried peas, beans and lentils (e.g. pea soup, cooked beans)														
619	Mushrooms (of any kind)														

*) Less frequently than once a month, or not at all

7. Fruit and berries (Please take into account both fresh and processed fruit and berries, and also fruit and berries in dishes, but omit juices and highly sugared fruit or berry jam and marmalade)

		Times a month				Times a week						Times a day			
		<1 *)	1	2	3	1	2	3	4	5	6	1	2	3	4 or more
701	Citrus fruits (e.g. orange, clementine, mandarin, grapefruit, lemon)														
702	Banana														
703	Apple														
704	Pear														
705	Peach, nectarine, apricot														
706	Kiwi														
707	Melons														
708	Plums, cherries														
709	Grapes														
710	Pineapple														
711	Strawberries														
712	Raspberries, blackberries														
713	Currants, gooseberries														
714	Blueberries / bilberries, lingonberries / cowberries, Cranberries														

*) Less frequently than once a month, or not at all

How often do you usually eat different sorts of bread?

Think about the last year when answering the questions. One answer/row.

5. Bread

		Slices a week							Slices a day			
		<1)	1	2	3	4	5	6	1-2	3-4	5-6	7 or more
501	Bread, all types, total											
502	<i>National breads:</i> fiber content > <i>about</i> 6 g/100 g or > 3 g/slice											
503	<i>National breads:</i> fiber content <i>about</i> 3-6 g/100 g or 1.5-3g/slice											
504	<i>National breads:</i> fiber content < <i>about</i> 3 g/100 g or < 1.5 g/slice											

*) Less than 1 slice per week, or not at all

C)

8a. What kind of food do you usually eat?

- Mixed food: I eat several kinds of foods 801
 Vegetarian food: I do not eat meat 802

If the answer was “Vegetarian” food, the following will be asked:

8b. Do you eat something else in addition to the vegetable foods

- Nothing else (only foods of vegetable origin) 803
 Fish 804
 Eggs 805
 Dairy products 806
 Other foods 807

THANK YOU FOR PARTICIPATING!

Appendix 3. The demographic background questions

- 1. Gender** 1 Male 2 Female
- 2. How old are you?** _____years
 - 1 15-24 years
 - 2 25-34 years
 - 3 35-49 years
 - 4 50-74 years
- 3. Geographical area** Country specific classification 1-5.
- 4. Residence**
 - 1 Capital area 2 Other big cities
 - 3 Smaller cities 4 Village/rural area
- 5. Marital status**
 - 1 Married/Common-law marriage /cohabitant
 - 2 Single
 - 3 Divorced/Separated
 - 4 Widowed
 - 5 Not willing to answer
- 6. Latest terminated education**
Country specific classification 1-4.
- 7. Years of full-time education after the compulsory school**
 - 1 None
 - 2 1-3 years
 - 3 4-6 years
 - 4 More than 6 years
- 8. Total annual household gross income (before tax)?**
Country specific classification 1-3 (high/medium/low)
- 9. Working situation**
 - 1 Working (full/part time)
 - 2 At home/housewife, etc.
 - 3 Student
 - 4 Retired
 - 5 Unemployed
- 10. Your trade/profession?**
 - 1 Farmer (farming, cattle raising, forestry)
 - 2 Worker (industrial, mining, construction, etc.)
 - 3 Office work, intellectual work

- 4 Independent entrepreneur
- 5 Managing position

11. Family situation

- 1 Single
- 2 Family without children
- 3 Adult household (all members over 18 yrs)
- 4 Household with children (under 18 yrs)

12. Children under 18 years at home _____ persons

13. Ethnicity Country specific

Appendix 4. The NORBAGREEN main study sample classified by the background questions (percentages)

	Finland	Åland	Sweden	Norway	Denmark	Iceland	Estonia	Latvia	Lithuania
Sex									
Men	50	50	50	50	49	51	46	49	47
Women	50	50	50	50	51	49	54	54	53
Age									
15-24 (Sweden and Denmark 16-24)	17	15	14	17	13	21	18	19	19
25-44	37	37	36	41	37	39	37	36	40
45-64	33	36	32	33	32	31	32	32	29
65-74 (Sweden and Denmark 65-80)	13	13	18	9	17	9	13	13	12
Geographical area									
	Southern Finland 41	Mariehamn 41	Götaland 32	Capital area (Oslo, Akershus) 20	The greater Copenhagen area 23	Southern part of the country 7	Tallinn and Harjumaa 39	Riga 32	Vilnius region 32
	Western Finland 35	Countryside 59	Svealand 21	Remaining eastern Norway 28	Rest of Sealand 22	Eastern part 4	West-Estonia 12	Vidzeme 24	Kaunas region 25
	Eastern Finland 11		Norrland 13	Southern Norway 5	Funen 9	Northern part 13	Virumaa 18	Kurzeme 14	Klaipeda region 14
	Oulu 9		Stockholm area 19	Western Norway 29	Southern Jutland 9	Western part 76	Middle-Estonia 9	Zemgale 15	Siauliai region 13
	Lapland 4		Göteborg area 9	Central Norway 8	Eastern Jutland 19	Westfjords -	South-Estonia 22	Latgale 16	Panevezys region 15
			Malmö area 6	Northern Norway 10	Western Jutland 9				
					Northern Jutland 9				
Residence									
Capital area	16		19	20	33	61	29	32	19
Other big cities	25		15	17	12	18	20	14	25
Smaller cities	32		21	20	24	8	19	25	26
Village / rural area	27		45	43	31	13	31	29	30

Continues on the next page

Appendix 4. continues

	Finland	Åland	Sweden	Norway	Denmark	Iceland	Estonia	Latvia	Lithuania
Latest terminated education									
Compulsory school	30	25	18	18	20	19	21	20	24
General education institutes / Secondary school, etc.	10	9	47	37	32	25	27	19	25
Vocational and professional education institutes / lower level of higher education	44	48	10	33	30	33	35	44	32
University / graduate	16	18	25	12	8	21	17	16	19
No answer					10	3			
Total annual household gross income									
High	20	29	20	39	6	15	6	22	30
Medium	29	34	51	23	31	32	23	30	32
Low	28	21	19	9	41	32	52	37	31
No answer	23	16	9	29	22	22	19	11	8
Working situation									
Working (full/part time)	58	69	61	67	60	70	55	54	47
At home / housewife, etc.	3	7	1	3	1	2	6	3	5
Student	14	8	11	16	13	17	12	11	13
Retired	22	15	22	13	24	9	20	21	21
Unemployed	4	0	3	1	3	1	5	11	13
No answer			2			1	1		1
Family situation									
Single	24	19	33	15	36	12	20	12	16
Family without children	19	25	14	35	2	22	12	9	7
Adult household	19	10	23	8	33	12	25	30	27
Household with children	39	46	30	41	29	53	40	48	49
No answer						1	2		
Ethnicity									
Own	99	95	93	95	99		74	58	86
Russian							21	32	8
Other	1	5	7	5	1		5	10	6
No answer						100	1		

Appendix 5. Example computation of a weighting coefficient

Actual number of people in Finland who meet NORBAGREEN subject inclusion requirements	3 885 544	
Women 15-24 years, actual number in South Finland	126 355	
Proportion of these women in the total eligible population (126355/3885544=)	3.252 %	
Number of respondents (total)	1009	
0.03252 * 1009=	33	Ideal number of women from South Finland aged 15-24 among respondents
Actual number of respondents who are women aged 15-24 from South Finland	34	
Ideal number of respondents of the target group divided by the actual number of respondents from that target group (33/34=)	0,971	Weighting coefficient (0.971 * 34 = 33)

Appendix 6. Country representatives of the study group

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The NORBAGREEN 2002 study

Consumption of vegetables, potatoes, fruit, bread
and fish in the Nordic and Baltic countries

The food groups fruit, vegetables, bread and fish have been proposed to be monitored as dietary indicators for health. The lack of food consumption data that are truly comparable across countries is an internationally known problem. The aim of the NORBAGREEN 2002 study was to examine the consumption frequency of these foods as well as of potatoes with comparable methods in the Nordic and the Baltic countries, and to produce and validate a food frequency questionnaire for this purpose. A secondary aim of the study was to compare the results with current dietary guidelines. This publication reports the results of the study for all countries, for all respondents and for men and women separately.

ISBN 92-893-0952-0



Nordic

COUNCIL OF MINISTERS