

Supplemental Table II. Serum 25-hydroxyvitamin D concentrations in different populations in the Nordic countries.

Country	Study	Cohort/study year	Study population	Serum or plasma 25(OH)D nmol/l Mean (SD)	% of subjects with 25(OH)D below 50 nmol/l cut-off	25(OH)D assay method Quality control of assay (certificate; CV% <15%)	Season blood samples taken
<i>Adults/general population</i>							
<i>Denmark</i>							
	Hansen et al. [44]	StatusD (2012-2014)	1048 men and 1517 women >18 y	Median (5-95%): <i>men</i> 43 (18-87) <i>women</i> 57 (21-103)	<i>Men</i> spring 60%, autumn 18% <i>Women</i> spring 43%, autumn 13%	LC-MS/MS DEQAS; yes	Spring and autumn
	Cashman et al. [42]	VitMad (2010-2011)	420 adults 18-60 y	62.0 (57.3-66.7†)	23 %	VDSP-recalculated results based on LC-MS/MS (originally analysed with Isotope-dilution LC-MS/MS) DEQAS in VDSP; yes	Autumn
	Cashman et al. [42]	Health 2006 (2006-2008)	3409 adults 19-72 y	65.0 (60.9-69.1†)	24 %	VDSP-recalculated results based on LC-MS/MS (originally analysed with Roche chemiluminescence immunoassay) DEQAS in VDSP; yes	All
<i>Finland</i>							
	Jääskeläinen et al. [13]	Health 2011	6134 adults >30 y	All 65 (65-66†) Supplement non-users 62 (61-62†)	All 9% Supplement non-users 14%	VDSP-recalculated results based on LC-MS/MS (originally analysed with Architect CMIA) DEQAS in VDSP; yes	All (adjusted for season)
	Raulio et al. [45]	FinDiet 2012	1295 adults 25-64 y	All: Men 63 (24) Women 67 (24) Supplement non-users: Men 58 (20) Women 58 (19)	Men 26 % Women 21 %	Architect CMIA DEQAS; yes	January-April
<i>Iceland</i>							
	Steingrimsdottir et al. [47]	National population register-based study (2001-2003)	944 adults 30-85 y (358 30-45 y, 341 50-65 y)	February-March all subjects: supplement non-users 28.8 (13.8) supplement users 46.8 (20.3) All seasons: 30-45 y 42.8 (19.8) 50-65 y 45.8 (19.8)	na	Diasorin RIA na; yes	All
<i>Norway</i>							
	Cashman et al. [43]	Tromsø Study (2007-2008)	12 817 adults 30-87 y	65.0 (17.6)	36 %	VDSP-recalculated results based on LC-MS/MS (originally analysed with Roche chemiluminescence immunoassay) DEQAS in VDSP; yes	All
	Petrenya et al. [46]	SAMINOR 2 Clinical Survey (2012-2014)	4465 adults 40-69 years	64.0 (19.2)	25 %	IDS iSYS DEQAS; yes	January-June, September-November
<i>Sweden</i>							
	Brugård Konde [11]	Riksmaten 2010-2011	268 adults 18-80 y	63.5 (18.2)	22 %	LC/MS DEQAS; na	All

Older adults

<i>Denmark</i>	Andersen et al. [48]	2002	52 women 70-75 y	Medians 47-51 (winter) 67 (summer)	48-56% winter 19% summer	HPLC DEQAS; yes	February- March, August- September
<i>Finland</i>	Jääskeläinen et al. [13]	Health 2011	774 individuals 65-74 y, 366 individuals 75+ y	65-74 y 66 (66-67†) 75+ y 65 (64-66†)	65-74 y 5% 75+ y 10%	VDSP-recalculated results based on LC-MS/MS (originally analysed with Architect CMIA) DEQAS in VDSP; yes	All (adjusted for season)
<i>Iceland</i>	Cashman et al. [43]	AGES Reykjavik (2002-2006)	5519 individuals 66- 96 y	57.0 (17.8)	34 %	VDSP-recalculated results based on LC-MS/MS (originally analysed with Diasorin Liaison) DEQAS in VDSP; yes	All
<i>Norway</i>	Holvik et al. [49] (exact data from [12])	NOREPOS Study of different cohorts: HUSK 1997-99 HUBRO 2000-01 HUNT 2 1995-97 Tromsø 4 1994	65-79 y: HUSK n=221 HUBRO n=211 HUNT 2 n=843 Tromso 4 n=163	HUSK 57 (22) HUBRO 63 (22) HUNT 2 55 (20) Tromso 4 54 (16)	HUSK 43% HUBRO 32% HUNT 2 45% Tromso 4 46%	HPLC-atmosphere pressure chemical ionization-mass spectrometry na; yes	All except July
<i>Sweden</i>	Brugård Konde [11]	Riksmaten 2010-2011	66 individuals 65-80 y	65.0 (15)	17 %	LC/MS DEQAS; na	All

Infants, children and adolescents

<i>Denmark</i>	Hansen et al. [44]	StatusD (2012-2014)	264 boys and 263 girls 2-17 y	Median (5-95%): boys 43 (19-82) girls 45 (18-84)	Boys spring 62%, autumn 16% Girls spring 60%, autumn 13%	LC-MS/MS DEQAS; yes	Spring and autumn
	Cashman et al. [42]	VitMad (2010-2011)	345 children 4- 17 y	61.6 (56.9-66.3)†	17 %	VDSP-recalculated results based on LC-MS/MS (originally analysed with Isotope-dilution LC-MS/MS) DEQAS in VDSP; yes	Autumn
	Cashman et al. [43]	OPUS School Meal Study (2011-2012)	779 children 8- 11 y	56.1 (16.7)	37 %	VDSP-recalculated results based on LC-MS/MS (originally analysed with Diasorin Liaison) DEQAS in VDSP; yes	Spring (2.7%) and summer (97.3%)
<i>Finland</i>	Rosendahl et al. [52]	ISCOLE (2013)	171 children 10 y	73 (22)	16 %	Roche Diagnostics immunochemiluminescence na; na	January-June
	Hauta-alus et al. [57]	VIDI (2013-2014)	584 newborns	Cord blood 88 (22)	Cord blood 1%	IDS-iSYS DEQAS; yes	All
<i>Iceland</i>	Thorisdottir et al. [30]	Icelandic Children followed up from Infancy (2011)	139 children 6 y	57 (18)	36 %	Roche ECLIA , na; na	June-December

	Thorisdottir et al. [50]	2006	72 infants 1 y	98.1 (32.2)	8 %	Roche ECLIA , na; na	All
<i>Norway</i>	Cashman et al. [43]	FitFutures (2010-2011)	890 adolescents 15-18 y	38 (18)	76 %	LC-MS/MS DEQAS; yes	September- April
<i>Sweden</i>	Warensjö Lemming et al. [29]	Riksmaten Ungdom 2016-2017	11-13 y children at fifth class (n=331) 12-16 y children at eight class (n=410) 2nd class high school 17-21 y (n=359)	5th class boys 56 (15) 5th class girls 50 (14) 8th class boys 54 (16) 8th class girls 53 (17) high school boys 47 (16) high school girls 53 (22)	5th class boys 32% 5th class girls 48% 8th class boys 38% 8th class girls 43% high school boys 62% high school girls 43%	HPLC-APCI-MS/MS DEQAS; yes	September- May
	Åkeson et al. [51]	2012-2013	110 children aged 5-7 y	Northern Sweden 67 Southern Sweden 59	14% Northern Sweden, 30% Southern Sweden	LC-MS/MS na; yes	November and December
<i>Immigrants</i>							
<i>Denmark</i>	Grønberg et al. [32]	ODIN FOOD 2015	72 Pakistani women 18-50 y	46.9 (22)	32 %	LC-MS/MS	Autumn
<i>Finland</i>	Adebayo et al. [36]	MarwoD (2014)	47 Somali women 21-64 y	52 (15)	56 %	LC-MS/MS DEQAS; yes	December
	Adebayo et al. [35]	Finnish Migrant Health and Wellbeing Study (Maamu) (2010-2012)	1310 immigrants of Russian, Somali and Kurdish origin 18-64 y	Russian 64 (62,66) Somali 44 (41, 46) Kurdish 35 (34,37)	Russian 28% Somali 75% Kurdish 85%	VDSP-recalculated results based on LC-MS/MS (originally analysed with Architect CMIA) DEQAS in VDSP; yes	All
<i>Iceland</i>	na	na	na	na	na	na	na
<i>Norway</i>	Madar et al. [60]	2015	102 infants with immigrant background, 9-16 months	52 (17)	50 %	LC-MS/MS DEQAS; yes	February- September
	Madar et al. [34]	2004-2006	45 Pakistani, 25 Turkish and 10 Somali mothers 6 weeks afte giving a birth, mean age 28 y	Pakistani 27 (17) Turkish 26 (14) Somali 22 (12)	Pakistani 93% Turkish 88% Somali 90%	HPLC-APCI-MS/MS DEQAS; yes	All

<i>Sweden</i>	Knutsen et al. in [12]	2011	251 adults with non-Western immigrant background (95 from South Asia, 36 from Middle-East/Northern Africa, 120 from Sub-Saharan Africa)	All 28.9 South-Asia 25.8 Middle East/Northern Africa 22.1 Sub-Saharan Africa 33.5	Below 25 nmol/l: All 53% South-Asia 60% Middle East/Northern Africa 72% Sub-Saharan Africa 42%	HPLC-MS/MS DEQAS; yes	January-March
	Granlund et al. [58]	2009-2010	216 adults aged 25-65 y with Middle Eastern (139) or African (77) immigrant background	Middle East 43 (16) Africa 38 (17)	Middle East 67% Africa 83%	LC-MS/MS DEQAS; yes	September-June
	Åkeson et al. [51]	2012-2013	98 children with immigrant background 5-7 y	Northern Sweden 56 Southern Sweden 42	45% Northern Sweden, 75% Southern Sweden	LC-MS/MS na; yes	November and December
<i>Pregnant women</i>							
<i>Denmark</i>	Andersen et al. [54]	2010-2012	1348 women at 1st trimester (8-16 wk)	63.9 (21.9)	28 %	LC-MS/MS na; na	All
<i>Finland</i>	Hauta-alus et al. [57]	VIDI (2013-2014)	584 women at 1st trimester (6-13 wk) (18-43 y)	89 (19)	1 %	IDS-iSYS DEQAS; yes	All
<i>Iceland</i> <i>Norway</i>	na	na	na	na	na	na	na
	Eggemoen et al. [56]	2008-2010	748 mothers (59% ethnic minorities) at gestation week 15 and 28	All 50 (27)/59 (29) According to region of origin: West Europe 69 (24)/72 (28) South Asia 32 (19)/46 (23) Middle East 34(20)/51 (29) Sub-Saharan Africa 38 (18)/45 (25) East Asia 51 (17)/53(19) Others 56 (21)/63 (26)	According to region of origin: West Europe 20%/na South Asia 84%/62% Middle East 79%/58% Sub-Saharan Africa 75%/63% East Asia 43%/na	Diasorin RIA DEQAS; intra yes/inter 13-16%	All

Sweden

Bärebring et al. [55]	2013-2014	1985 pregnant women (multiethnic cohort) at first and 3rd trimester	1st 64.5 (24.5) 3rd 74.7 (34.4)	1st trimester: All 25% According to country of origin: Africa 82% Asia 69% North Europe 13%	LC-MS/MS DEQAS; yes	September- November and February-June
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† 95% confidence interval

25(OH)D: 25-hydroxyvitamin D; CMIA: chemiluminescent microparticle immunoassay; CV%: coefficient of variation; DEQAS: Vitamin D External Quality Assessment Scheme; ECLIA: electrochemiluminescence immunoassay

HPLC-APCI-MS/MS: High Performance Liquid Chromatography-Atmospheric Pressure Chemical Ionization-Mass Spectrometry; LC-MS/MS: liquid chromatography-tandem mass spectrometry; RIA: radioimmunoassay

VDSP: Vitamin D Standardization Program