**Appendix 2:** **Characteristics of included studies investigating salt intake in the WHO European Region**

| **Country** | **Study authors, survey name, or organisation name** | **Year of data collection** | **Method of measurement** | **Total sample size (n)** | **Male (n)** | **Female (n)** | **Age (y)** | **Population characteristics** | **Representativeness (National, subnational, urban, rural, not representative)** | **Measurement quality assessment** i |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Albania | Llanaj et al.(38) | 2015-16 | 24h dietary recall | 289 | 37 | 252 | 18 - 24 | Bachelor students at three universities in the capital city | Not representative | 2 |
| Andorra | Ministry of Health, Government of Andorra(43) | 2017-18 | 24h dietary recall & dietary records | 991 | 521 | 470 | 12 - 75 | Random sample from all seven parishes of Andorra | National | 4ii |
| Armenia | WHO STEPS Survey 2016(44) | 2016 | Spot urine collection | 985 | 261 | 724 | 18 - 69 | Random stratified sample from 194 primary sampling units | National | 6 |
| Austria | Austrian Nutrition Survey 2012 & Rippin et al.(45) | 2010-12 | Spot urine collection | 615 | 231 | 384 | 18 - 80 | Quota sample from 7 states | National | 6 |
| Azerbaijan | WHO STEPS Survey 2017(46) | 2017 | Spot urine collection | 2487 | 1026 | 1461 | 18 - 69 | Random stratified sample from 240 primary sampling units | National | 6 |
| Belarus | WHO STEPS Survey 2016(47) | 2016 | Spot urine collection | 4042 | 1687 | 2355 | 18 - 69 | Random stratified sample from 288 clusters | National | 6 |
| Belgium | Vandevijvere et al.(41) | 2007-09 | 24h urine collection | 249 | 126 | 123 | 45 - 65 | Convenience sample of adults in Ghent (Flanders region) and Liège (Walloon region) | Not representative | 8 |
| Bosnia and Herzegovina | Gicevic et al.(48) | 2016-17 | 24h dietary recall | 853 | 371 | 482 | 18 - 60+ | Random sample of adults from 980 households | National | 4 |
| Bulgaria | Duleva et al.(49) | 2016 | Spot urine collection | 306 | 153 | 153 | 20 - 65+ | Random sample from 28 administrative districts | National | 5 |
| Croatia | Jelakovic et al.(50) | 2008 | 24h urine collection | 504 | Unknown | Unknown | 46.3 7.3 | Random sample of patients in two general practitioner outpatient clinics | Urban & Rural | 7 |
| Cyprus | Cyprus Dietetic and Nutrition Association\* | 2009 | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown |
| Czech Republic | De Keyzer et al.(42) | 2007-08 | 24h urine collection | 118 | 58 | 60 | 45 - 65 | Convenience sample of adults | Not representative | 9 |
| Denmark | Danskernes Kostvaner 2011-2013(51) | 2011-13 | Spot urine collection & food frequency questionnaire | 3016 | 1464 | 1552 | 18 - 75 | Random sample of adult Danish citizens | National | 6 |
| Estonia | Estonian National Dietary Survey(52) | 2013-15 | 24h dietary recall | 2713 | 907 | 1806 | 18 - 74 | Random stratified sample of Estonian residents | National | 2 |
| Finland | FinDiet 2017(53) | 2017 | Spot urine collection & 24h dietary recall | 1655 | 780 | 875 | 18 - 74 | Unknown | National | 6 |
| France | Étude individuelle nationale des consommations alimentaires 3(54) | 2014-15 | 24h dietary recall | 2121 | 887 | 1234 | 18 - 79 | Random stratified sample of individuals living in metropolitan France | National | 4 |
| Georgia | WHO STEPS Survey 2016(55) | 2016 | Spot urine collection | 1252 | 352 | 900 | 18 - 69 | Random sample from 371 stratified clusters | National | 6 |
| Germany | Johner et al.(37) | 2008-11 | Spot urine collection | 6962 | 3340 | 3622 | 18 - 79 | Random sample of adults | National | 6 |
| Greece | Vasara et al.(56) | 2015-16 | 24h urine collection | 252 | 114 | 138 | 18 - 75 | Opportunistic sampling of adults in the Thessaloniki greater metropolitan area | Urban | 8 |
| Hungary | National Institute of Pharmacy and Nutrition† | 2010 | 24h urine collection | 153 | 67 | 86 | 18+ | Unknown | National | 7 |
| Iceland | Hvað borða Íslendingar? Könnun á mataræði Íslendinga 2010–2011(57) | 2010-11 | 24h dietary recall | 1312 | 632 | 680 | 18 - 80 | Random sample of adults | National | 4 |
| Ireland | Safefood(58) | 2008-09 | 24h urine collection | 488 | 306 | 182 | 18 – 81 | Random sample of adults from the general population, and convenience samples of university students and an occupational group | Subnational | 9 |
| Israel | Stern et al.(59) | 2015-17 | 24h urine collection | 582 | 266 | 316 | 25 - 65 | Random sample of adults from six out of seven state districts | National | 8 |
| Italy | Donfrancesco et al.(60) | 2018-19 | 24h urine collection | 1977 | 967 | 1010 | 35 - 74 | Random stratified sample of adults from 10 regions | National | 8 |
| Kazakhstan | Trieu et al.(61) | 2015-16 | 24h urine collection | 478 | 232 | 246 | 25 - 64 | Random stratified sample of adults from 40 clusters in two cities | Urban & Rural | 8 |
| Kyrgyzstan | *Proxy data* | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Latvia | National Diagnostic Centre and the Food and Veterinary Service Food Centre & Rippin et al.(62,45) iii | 2008 | 24h dietary recall & food frequency questionnaire | 1377 | 706 | 671 | 17 - 64 | Random stratified sample of Latvian residents | National | 4 |
| Lithuania | NATRIJOD survey‡ | 2018-20 | 24h urine collection | 888 | 466 | 422 | 18 - 69 | Representative sample of Lithuanian adults | National | 8 |
| Luxembourg | ORISCAV-LUX2 (Observation of CardioVascular Risk Factors in Luxembourg, wave 2)(63) § | 2016-17 | Food frequency questionnaire | 1326 | 617 | 709 | 25 - 69 | Random sample of adults | National | 3 |
| Malta | National Food Consumption Survey¶ | 2015-17 | 24h dietary recall | 625 | 267 | 358 | 18 - 65+ | Random stratified sample of adults in Malta and Gozo | National | 4 |
| Moldova | D’Elia et al.(64) | 2016 | 24h urine collection | 858 | 326 | 532 | 18 - 69 | Random sample of adults from 150 primary sampling units | National | 8 |
| Monaco | *Proxy data* | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Montenegro | D’Elia et al.(65) | 2017 | 24h urine collection | 639 | 285 | 354 | 25 - 65 | Random sample of patients in the Primary Health Centre, Podgorica | Urban | 8 |
| Netherlands | National Institute for Public Health and the Environment (RIVM)(66) | 2015 | 24h urine collection | 289 | 135 | 154 | 19 - 70 | Random sample of adults in Doetinchem | Urban | 8 |
| North Macedonia | State Statistical Office(67) | 2019 | Household budget survey | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | 1 |
| Norway | Meyer et al.(68) | 2015-16 | 24h urine collection | 493 | 241 | 252 | 40 - 69 | Random subsample of participants in the Tromsø Study | Urban | 8 |
| Poland | Department of Social Research and Living Conditions, Central Statistical Office# | 2016 | Household budget survey | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | 1 |
| Portugal | Polonia et al.(69) | 2011-12 | 24h urine collection | 2568 | 1234 | 1344 | 18 - 90 | Random stratified sample of adults | National | 8 |
| Romania | Dorobantu et al.(39) | 2015-16 | Spot urine collectioniv | 1970 | 934 | 1036 | 18 - 80 | Random stratified sample of adults | National | 6 |
| Russian Federation | Russian Federal State Statistics Service(70) | 2018 | 24h dietary recall | 45000 households | Unknown | Unknown | 16 - 74 | Unknown | National | 2 |
| San Marino | *Proxy data* | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Serbia | Jovičić-Bata et al.(40) | 2011-12 | 24h dietary recall | 266 | 120 | 146 | 21.26 ± 1.97 | Convenience sample of undergraduate students from the University of Novi Sad | Not representative | 2 |
| Slovakia | Ministry of Health, Slovak Republic\*\* | 2017 | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown |
| Slovenia | Hlastan-Ribič et al.(71) | 2007 | 24h urine collection | 143 | 61 | 82 | 25 - 65 | Random sample of adults | National | 8 |
| Spain | Ortega et al.(72) | 2009 | 24h urine collection | 418 | 196 | 222 | 18 - 60 | Random sample of adults from 15 provinces | National | 8 |
| Sweden | Livsmedelsverket(73) | 2010 | Dietary record | 1797 | 792 | 1005 | 18 - 80 | Random stratified sample of adults | National | 2 |
| Switzerland | Chappuis et al.(74) | 2010-11 | 24h urine collection | 1350 | 663 | 687 | 15 - 60+ | Random stratified sample of Swiss adults 15y and over | National, but not representative | 8 |
| Tajikistan | WHO STEPS Survey 2017(75) | 2016 | Spot urine collection | 2718 | 1100 | 1618 | 18 - 69 | Random stratified sample from 2880 households | National | 6 |
| Turkey | Erdem et al.(76) | 2012 | 24h urine collection | 464 | 210 | 254 | 18+ | Random stratified sample of adults from 4 major cities | National | 8 |
| Turkmenistan | WHO STEPS Survey 2018(77) | 2018 | Spot urine collection | 2039 | 860 | 1179 | 18 - 69 | Random stratified sample from 4320 households | National | 6 |
| Ukraine | WHO STEPS Survey 2019(36) | 2019 | 24h urine collection | 113 | 26 | 87 | 18 - 69 | Random stratified sample of adults from 1764 households | National | 8 |
| United Kingdom | Public Health England(78) | 2018-19 | 24h urine collection | 596 | 286 | 310 | 19 - 64 | Random stratified sample of adults living in private households in England | Subnational | 9 |
| Uzbekistan | World Health Organization(79) | 2015 | 24h urine collection | 598 | 252 | 346 | 18 - 64 | Random stratified sample from 5 regions | National | 7 |

**Notes**

i. Modelled after the grading scale developed by Powles and colleagues(45), with slight modification to reflect the inclusion of spot urine collection as an accepted method of measurement in this paper. There are nine levels to this grading scale, with 9 being the highest possible score, reflecting the best evidence, and vice versa.

1. Household availability/budget survey;
2. Single short-term diet records/recalls;
3. Food frequency questionnaires;
4. Multiple (≥2) short-term diet recalls/records;
5. Other spot urine collection protocols without use of creatinine, or not reported;
6. Spot urine collection with exclusions based on observed/expected creatinine ratio or total urinary creatinine;
7. Other strict 24h urine collection protocols without the use of PABA or creatinine;
8. 24h urine collection with exclusions based on observed/expected creatinine ratio or total urinary creatinine;
9. 24h urine collection with PABA validation

ii. Combination of one 24h dietary recall and two dietary records.

iii. The data presented here are the weighted means excluding the 7-16-year-old population group, calculated by Dr Holly Rippin (WHO Europe).

iv. The data presented in the study was in the form of estimated 24h urinary sodium excretion calculated with the Kawasaki formula, which is known to have the potential for bias and unreliability(81,82), using sodium excretion values measured from a spot urine sample.

v. The reference numbers in this appendix refers to the main manuscript reference list.

\* Personal communication with Ms Eliza Markidou, Ministry of Health, Republic of Cyprus.  
† Personal communication with Dr Eszter Sarkadi Nagy, National Institute of Pharmacy and Nutrition, the successor of the National Institute for Food and Nutrition Science.  
‡ Personal communication with Prof Dr Marius Miglinas, Vilnius University, data from the unpublished study "NATRIJOD".  
§ Supplemented by unpublished data from personal communication with Dr Isabelle Ernens, Luxembourg Institute of Health.  
¶ Personal communication with Dr Daniel Cauchi, Ministry of Health, Malta.  
# Calculations of the Department of Food and Nutrition Economics of Institute of Food and Nutrition, based on unpublished data from the Department of Social Research and Living Conditions of the Central Statistical Office, Poland.  
\*\* Personal communication with Dr Jozef Suvada, Ministry of Health, Slovak Republic.