Title: Trends in vitamin, mineral and dietary supplement use in Switzerland. The CoLaus study.

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Journal: European journal of clinical nutrition

Year: 2016 Aug 10

DOI: 10.1038/ejcn.2016.137

Trends in vitamin, mineral and dietary supplement use in Switzerland. The CoLaus study.

Running title: trends in vitamin/mineral supplement use

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Word count: 3316

Number of tables: 4 **Figures**: 1 **References**: 41

Number of online supporting materials: 1 file with 7 tables

CONFLICT OF INTEREST

PV and GW received funding from the Swiss National Science Foundation (Bern, Switzerland); GlaxoSmithKline (Philadelphia, PA, USA) and the Faculty of Biology and Medicine of Lausanne (Lausanne, Switzerland) to conduct the CoLaus study. PMV indicates no conflict of interest.

ABSTRACT

Background: vitamin/mineral (VMS) and dietary supplements (DS) use is common in Switzerland, but nothing is known regarding the factors associated with their initiation, discontinuation or continuation of intake.

Methods: prospective study conducted between 2003-6 and 2009-12 in Lausanne, Switzerland among 4676 participants (2525 women, age range 35-75 years). VMS were defined as single or multivitamin/multimineral preparations; DS were defined as any dietary supplement.

Results: VMS use was 20.6% at baseline and 20.3% at follow-up (p=0.69): 559 (12.0%) participants discontinued; 545 (11.7%) initiated and 404 (8.6%) continued VMS use. On multivariable analysis, men had a lower relative risk ratio (RRR) of discontinuing, initiation or continuing; older age and being physically active were associated with a higher RRR of initiation or continuing; lower education and higher body mass index were associated with a lower RRR of discontinuing or continuing of VMS.

DS use decreased from 10.4% to 6.8% (p<0.001): 405 (8.7%) participants discontinued; 239 (5.1%) initiated and 81 (1.7%) continued DS use. On multivariable analysis, men had a lower RRR of discontinuing, initiation or continuing; older age had a higher RRR of initiation, discontinuing or continuing; being physically active was associated with a higher RRR of initiation or continuing; Swiss citizens and former smokers had a higher RRR of discontinuing.

Conclusion: VMS use is stable in the Lausanne population, while DS use appears to be decreasing. Individuals can be categorized either as users or non-users depending on the study period, and consistent users are only a small fraction of prevalent users.

Abstract word count: 249

Keywords: supplements; epidemiology; prospective study; discontinuing; persistence; Switzerland.

INTRODUCTION

Vitamin and mineral supplements (VMS) are taken by a significant fraction of the general population [1-5], although their health benefits are questionable [6-8]. If some VMS might be of interest (i.e. iron for anaemia and calcium/vitamin D for osteoporosis), several studies suggested that VMS either have no effect [9] or even increase total mortality [10]. Still, despite recommendations against the use of specific vitamins to prevent disease [11], the prevalence of VMS use is increasing in Europe and the USA [12-14]. Interestingly, VMS and dietary supplements (DS) use appears to be a fairly unstable behaviour in the general population, with high rates of initiation or discontinuing [15]. Several socio-demographic characteristics such as female gender, older age and lower body mass index have been shown to be associated with consistent VMS use [15], but the number of studies that assessed trends and determinants of VMS and DS use are relatively scarce [15, 16].

In a previous study, we showed that a sizable fraction of the Lausanne population consumed VMS or DS [17]. We now assessed trends in VMS and DS use and the factors associated with initiation, discontinuing and persistence of in VMS and DS use in the population of Lausanne, Switzerland.

MATERIALS AND METHODS

Sampling

The CoLaus Study is a prospective study aiming to assess the prevalence of cardiovascular risk factors and to identify new molecular determinants of these risk factors in the population of the city of Lausanne, Switzerland. The sampling procedure of the CoLaus Study has been described previously [18]. In summary, a simple, non-stratified random sample of the overall population of Lausanne was drawn. The following inclusion criteria were applied: (a) written informed consent and (b) willingness to take part in the examination and to provide blood samples. Recruitment began in June 2003 and ended in May 2006 and included 6184 Caucasian participants. The evaluation included an interview, a physical exam, blood sampling and a set of questionnaires. The follow-up was performed between April 2009 and September 2012, five and a half years on average after the collection of baseline data and was similar to the baseline evaluation.

Vitamin/mineral and dietary supplements

Vitamin/mineral supplements were defined as previously [17]. VMS and DS, including omega-3 supplements, were identified. Specific combinations of calcium and vitamin D were also identified.

For each group (VMS and DS) users were categorized as never (absent at baseline and follow-up), initiators (absent at baseline but present at follow-up), discontinuers (present at baseline but absent at follow-up) and continuers (present at baseline and follow-up) as performed in other studies conducted in antihypertensive drug treatment [19, 20]. In the prospective survey, drugs prescribed by a doctor were differentiated from those bought over-the-counter. As calcium + vitamin D supplements might be prescribed for osteoporosis prevention and iron ± vitamin B_{12} for anaemia, sensitivity analyses were carried excluding participants taking such combinations. Also for sensitivity analyses, participants were categorized as never, inconsistent (initiators or discontinuers) or consistent (continuers) users, as performed previously [15].

Other data

Educational level was categorized into mandatory school, apprenticeship, high school and university. Marital status was categorized into single/divorced/widowed and married/cohabitating. Country of birth was categorized into Swiss-born and born in another country. Smoking status was defined as never, former and current. . A participant was considered as physically active if he/she practiced at least twice per week leisure-time physical activities with a minimal duration of 20 minutes.

As presence of cardiovascular risk factors has been associated with initiation or maintenance of VMS [15], awareness of hypertension, dyslipidemia or diabetes was considered if the participant responded positively to the questions “did a doctor tell you that you were hypertensive / had high cholesterol levels / were diabetic?” respectively. No data was collected regarding other diseases such as arthrosis, cancer or osteoporosis.

Body weight and height were measured with participants standing without shoes in light indoor clothes. Body weight was measured in kilograms to the nearest 100 g using a Seca® scale, which was calibrated regularly. Height was measured to the nearest 5 mm using a Seca® height gauge. Overweight was defined as body mass index (BMI) ≥25 and <30 kg/m^2 and obesity as BMI≥30 kg/m^2. As the number of

underweight (BMI<18.5 kg/m^2) participants was very small (N=83 or 1.8% of the total sample), they were included in a "normal + underweight" category.

Statistical analysis

Participants were excluded if (a) they did not participate in the follow-up survey and (b) they had any missing socio-demographic data. Statistical analyses were performed using Stata version 13.1 for windows (Stata Corp, College Station, TX, USA). Descriptive results were expressed as number of participants (percentage) or as mean±standard deviation. Bivariate analyses were performed using chi-square for categorical variables and Student's t-test or analysis of variance for continuous variables. For continuous variables, post-hoc pairwise comparisons using the method of Scheffe were performed when the results of the ANOVA were statistically significant. In agreement with a previous study [15], multivariable analysis was performed with multinomial logistic regression using never users as the reference; the results were expressed as relative risk ratio (RRR) and 95% confidence interval (CI). Multi-collinearity of the dependent variables was tested using the collin function of Stata; variance inflation factors between 1.01 and 1.20 were obtained, suggesting that multi-collinearity was not present. Tests were two-sided and statistical significance was assessed for $p<0.05$.

Ethics statement

The CoLaus study was approved by the Institutional Ethics Committee of the University of Lausanne. The study was conducted according to the Declaration of Helsinki and all participants provided written informed consent prior to participating.

RESULTS

Selection procedure and characteristics of participants

Of the initial 6184 participants at baseline, 1501 (24.3%) did not participate in the follow-up survey and 7 (0.1%) had missing socio-demographic data. The selection procedure is summarized in **Figure 1** and the comparison between included and excluded participants is summarized in **supplemental Table 1**. Excluded participants were older, less frequently women, had a lower educational level, were less frequently born in Switzerland, were more frequently smokers, sedentary or obese and had a higher prevalence of self-reported hypertension and diabetes than included participants. Prevalence of VMS and DS use was also lower among excluded participants (**supplemental table 1**).

Trends and determinants of vitamin/mineral supplement use

Prevalence of VMS use was 20.6% at baseline and 20.3% at follow-up (p=0.69). During the 5.5 year study period, 559 (12.0%) participants discontinued; 545 (11.7%) initiated and 404 (8.6%) continued VMS use, while 3168 (67.8%) did not use any VMS at baseline and follow-up.

The bivariate associations between socio-demographic and clinical factors and being never using, initiating, discontinuing or continuing VMS are summarized in **supplemental table 2**. Significant associations were found with gender, age, educational level, marital status, Swiss citizenship, physical activity and BMI categories. These associations were partly confirmed by multivariate analysis, the results of which are summarized in **table 1**. Men had a lower RRR of discontinuing, initiating or continuing VMS use. Older age and being physically active were associated with a higher RRR of initiating and continuing VMS use. Having a lower education or a higher BMI was associated with a lower RRR of discontinuing and continuing VMS use. Finally, presence of reported dyslipidemia was associated with a higher RRR of continuing VMS use (**table 1**). Similar findings were obtained when the analysis was split by gender (not shown).

Trends and determinants of dietary supplements use

Prevalence of DS use was 10.4% at baseline and decreased to 6.8% at follow-up (p<0.001). During the 5.5 year study period, 405 (8.7%) participants discontinued; 239 (5.1%) initiated and 81 (1.7%) continued DS use, while 3951 (84.5%) did not use any DS at baseline and follow-up.

The bivariate associations between socio-demographic and clinical factors and being never using, initiating, discontinuing or continuing DS are summarized in **supplemental table 3**. Significant associations were found with gender, age, marital status, Swiss citizenship, smoking status, physical activity and BMI categories. These associations were partly confirmed by multivariate analysis, the results of which are summarized in **table 2**. Men had a lower RRR of discontinuing, initiating or continuing DS use. Older age was associated with a higher RRR of initiating, discontinuing and continuing DS use. Being physically active was associated with a higher RRR of initiating and continuing DS use. Swiss citizenship and being former smoker was associated with a higher RRR of discontinuing DS use (**table 2**). Similar findings were obtained when the analysis was split by gender (not shown).

157 *Sensitivity analyses*

158 The results of the sensitivity analysis on VMS use excluding calcium and vitamin D or iron and
159 vitamin B_{12} combinations were similar to those obtained when the analysis included all VMS, except that
160 some associations were no longer significant due to smaller sample sizes (not shown).

161 The results of the sensitivity analysis on never, inconsistent (initiating or discontinuing) and
162 consistent (continuing) use of VMS are summarized in **supplemental tables 4 and 5**. On bivariate analysis,
163 inconsistent use of VMS was associated with age, BMI, gender, educational level, marital and physical
164 activity status (**supplemental table 4**). Multivariate analysis showed that participants of male gender, lower
165 education, married or obese had a lower RRR of inconsistent users, while older or physically active
166 participants had a higher RRR of inconsistent use (**supplemental table 5**). Similar findings were obtained
167 when the analysis was split by gender (not shown).

168 The results of the sensitivity analysis on never, inconsistent (initiating or discontinuing) and
169 consistent (continuing) use of DS are summarized in **supplemental tables 6 and 7**. On bivariate analysis,
170 inconsistent use of DS was associated with age, BMI, gender, educational level, country of birth, smoking,
171 marital and physical activity status (**supplemental table 6**). Multivariate analysis showed that participants of
172 male gender or of lower education had a lower RRR of inconsistent use, while older, former smoker or
173 physically active participants had a higher RRR of inconsistent use (**supplemental table 7**). Similar findings
174 were obtained when the analysis was split by gender (not shown).

175 **DISCUSSION**

176 VMS use changes with time, a sizable number of users discontinuing during a 5.5 year follow-up,
177 being replaced by an almost similar number of previous never users initiating VMS, leading to a relatively
178 stable number of VMS users. Conversely, the prevalence of DS use decreased significantly.

179 *Trends and determinants of vitamin/mineral supplement use*

180 Several cross-sectional and prospective studies have shown an increase in VMS use in the general
181 population or in specific groups. In this study, VMS was relatively stable, the large number of participants
182 discontinuing being compensated by an almost similar number of participants initiating VMS use.
183 Interestingly, a large fraction of initiators was due to calcium and vitamin D combinations ant not to generic

VMS, suggesting that this increase was medically driven. These findings are partly in agreement with a previous study [15], with the difference that in the previous study the number of participants initiating VMS outweighed the number of participants discontinuing. Overall, our results indicate that individuals can be categorized either as VMS users or never users depending on the study period, and that VMS continuers are only a small fraction of prevalent VMS users.

Women and older age were significantly associated with both initiating and continuing VMS use, a finding in agreement with the literature [15]. A first explanation is that women and elderly people tend to be more health conscious and to adopt health-promoting behaviours such as VMS use. Another explanation is the prevention of osteoporosis in elderly women by vitamin D + calcium combinations. Indeed, among women, 273 (10.9% of all women, 71.6% of all women initiators) initiated the vitamin D + calcium combination, versus 63 (2.5% of all women, 11.3% of all women discontinuers) who discontinued. Thus, and in agreement with another study [16], our results suggest that most women VMS initiators did so for a medical and not for a personal reason.

Being physically active was associated with both the initiation and the continuation of VMS, a finding also reported elsewhere [15]. Physically active people tend to be more health-conscious and to adopt more frequently healthy eating and VMS use [21]. Whether physically active people initiated VMS to promote their health or to improve physical performance remains to be assessed.

In the sensitivity analyses, participants of lower education had a lower RRR of inconsistent (initiating or discontinuing) or consistent (continuing) VMS use, a finding partly in agreement with a previous study [15], where such associations were found in men only. Interestingly, when inconsistent users were split into initiators and discontinuers, the association with education was for discontinuing VMS only. The lower likelihood of discontinuing VMS among less educated people might be explained by the fact that participants with higher education consume more non-prescribed medicines [22], and thus change consumption more frequently.

Presence of disease has been shown to increase the initiation of VMS by patients [15], although this statement has been challenged [23]. Still, in this study, no consistent associations were found between self-reported hypertension, dyslipidemic or diabetic status and initiation of VMS. Interestingly, participants who

reported dyslipidemia had a higher RRR of continuing VMS, a finding also reported elsewhere [15]. Although some studies have shown a small effect of VMS on lipid levels [24] or carotid atherosclerosis [25], still VMS use is not recommended for the primary prevention of cardiovascular disease [11].

Trends and determinants of dietary supplements use

Contrary to a study conducted in the USA [16] but in agreement with another conducted in Scandinavia [26], the prevalence of DS users decreased. Possible explanations include the absence or low efficiency of DS [27-30] and tighter regulations regarding their health claims [31]. Still, it would be of interest that the decrease observed in this study could be confirmed by other independent studies. As for VMS, our results suggest that only a small fraction of all DS users continuously consumes them.[15] A possible explanation is that people adopt DS based on their health promises [32], then discontinue when these benefits are not met or when side effects occur [33]. Still, as the reasons for discontinuing were not collected, these explanations remain speculative. Also, the diversity of DS precluded any analysis of the associations between discontinuing DS and the type of DS used. Conversely, DS maintenance continuation could be due to the presence of an effect (or to the absence of adverse effects) of DS. Again, the reasons for continuation are unknown and it would be of interest that further studies focus on the reasons for initiating, continuing or discontinuing DS.

Former smokers were more likely to be discontinuers than never or current smokers. It is possible that former smokers initially used DS as aid to prevent smoking relapse or to prevent weight gain induced by quitting smoking, then quit DS due to their relative inefficiency [34, 35].

Physical activity was associated with DS initiation, discontinuing and continuation. If the findings regarding initiation and continuation are in agreement with the literature [15, 36, 37], the association of physical activity with DS discontinuing was unexpected. A possible explanation is that physically active participants initially relied on DS to boost their performances and discontinued if the DS did not met their expectations. As no information was collected regarding the reasons for discontinuing, this explanation should be confirmed in other studies.

Implications for public health nutrition

Our findings have several implications for public health nutrition. First, they confirm that both VMS and DS use is an unstable behaviour and that a sizable fraction of that discontinuers are replaced by

initiators. Thus, the overall effect of VMS or DS use on health outcomes might be considerably decreased. Indeed, our results may partly explain the lack of effect of VMS on mortality [9], as VMS intake might not have been consistent throughout the study period. Finally, the "cycling" of VMS or DS could also lead to the sporadic occurrence of side effects due to interactions of VMS or DS with prescribed drugs, with potentially major health consequences [38].

Study limitations

This study has several limitations worth acknowledging. First, excluded participants differed significantly from the included ones. Thus, it is likely that our results are based on a more health-conscious sample than the general population and that the prevalence estimates for VMS and DS use might be overestimated. Still, our drop-out rate (24.4%) is comparable to the one of a previous study assessing trends in VMS use (23.1%) [15]. Second, no data on duration or amount of VMS or DS use was collected; hence, it is possible that our estimates for the prevalence of continuers might be overestimated, as during the follow-up period some participants could have undergone several cycles of use/non-use of VMS or DS. Thus, future studies should consider the number and duration of use/non-use cycles when assessing VMS or DS use. Third, no information was collected regarding the type, intensity, duration and patterns of physical activity, and only the status of being physically active was collected; hence, it is likely that this assessment might be too weak to draw precise conclusions regarding the impact of physical activity on VMS or DS changes. Still, physical activity was significantly associated with initiation of VMS or DS, suggesting that even raw evaluations of physical activity status can be used in such studies. Fourth, changes in the baseline independent variables during follow-up (i.e. age, educational level, BMI changes) were not taken into account in the multinomial logistic model; still using time varying variables would preclude comparison with similar studies [15, 38] and could differ according to the criteria used to define change (i.e. in BMI levels) [39]. Finally, only data from Caucasian participants living in a Swiss city was available, and it is currently unknown if our findings apply to other ethnicities or to other countries; for instance, a prospective study conducted in UK women [40] showed a much higher frequency of consistent users (54%, vs. 8.6% in our study), while the frequency of inconsistent (initiation + discontinuation) users was comparable (25%, vs. 23.6% in our study). Thus, the prevalence of never users, initiators, discontinuers and continuers might not

be comparable between countries. Still, as the factors associated with VMS and DS use appear to be independent of the cultural and ethnic context [36, 37], they might be extrapolated to other countries.

Conclusion

In this population-based sample of the city of Lausanne, the prevalence of VMS use remained stable, but this apparent stability was due to high and comparable discontinuing and initiation rates. Conversely, DS use appears to be decreasing. Being physically active favours the initiation of VMS or DS, and older age favours the initiation of VMS.

ACKNOWLEDGEMENTS

The CoLaus study was and is supported by research grants from GlaxoSmithKline (no grant number), the Faculty of Biology and Medicine of Lausanne (no grant number), and the Swiss National Science Foundation (grants number 33CSCO-122661, 33CS30-139468 and 33CS30-148401). The funding sources had no involvement in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

CONFLICT OF INTEREST

PV and GW received funding from the Swiss National Science Foundation (Bern, Switzerland); GlaxoSmithKline (Philadelphia, PA, USA) and the Faculty of Biology and Medicine of Lausanne (Lausanne, Switzerland) to conduct the CoLaus study. PMV indicates no conflict of interest.

AUTHORS' CONTRIBUTIONS

PMV designed and conducted research, analyzed data and wrote paper; PV and GW provided essential materials and revised the article for important intellectual content. PMV had primary responsibility for final content, had full access to the data and is the guarantor of the study. All authors have read and approved the manuscript.

ACKNOWLEDGEMENTS

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REFERENCES

1. Skeie G, Braaten T, Hjartaker A, Lentjes M, Amiano P, Jakszyn P *et al.* Use of dietary supplements in the European Prospective Investigation into Cancer and Nutrition calibration study. *Eur J Clin Nutr* 2009; **63 Suppl 4:** S226-238. e-pub ahead of print 2009/11/06; doi: 10.1038/ejcn.2009.83

2. Lin JR, Lin YS, Kao MD, Yang YH, Pan WH. Use of supplements by Taiwanese adults aged 19-44 during 2005-2008. *Asia Pac J Clin Nutr* 2011; **20**(2)**:** 319-326. e-pub ahead of print 2011/06/15;

3. Timbo BB, Ross MP, McCarthy PV, Lin CT. Dietary supplements in a national survey: Prevalence of use and reports of adverse events. *J Am Diet Assoc* 2006; **106**(12)**:** 1966-1974. e-pub ahead of print 2006/11/28; doi: 10.1016/j.jada.2006.09.002

4. Imai T, Nakamura M, Ando F, Shimokata H. Dietary supplement use by community-living population in Japan: data from the National Institute for Longevity Sciences Longitudinal Study of Aging (NILS-LSA). *J Epidemiol* 2006; **16**(6)**:** 249-260. e-pub ahead of print 2006/11/07;

5. Guo X, Willows N, Kuhle S, Jhangri G, Veugelers PJ. Use of vitamin and mineral supplements among Canadian adults. *Can J Public Health* 2009; **100**(5)**:** 357-360. e-pub ahead of print 2009/12/10;

6. McCormick DB. Vitamin/mineral supplements: of questionable benefit for the general population. *Nutr Rev* 2010; **68**(4)**:** 207-213. e-pub ahead of print 2010/04/27; doi: 10.1111/j.1753-4887.2010.00279.x

7. Ford JA, MacLennan GS, Avenell A, Bolland M, Grey A, Witham M *et al.* Cardiovascular disease and vitamin D supplementation: trial analysis, systematic review, and meta-analysis. *Am J Clin Nutr* 2014; **100**(3)**:** 746-755. e-pub ahead of print 2014/07/25; doi: 10.3945/ajcn.113.082602

8. Vollset SE, Clarke R, Lewington S, Ebbing M, Halsey J, Lonn E *et al.* Effects of folic acid supplementation on overall and site-specific cancer incidence during the randomised trials: meta-

analyses of data on 50,000 individuals. *Lancet* 2013; **381**(9871)**:** 1029-1036. e-pub ahead of print 2013/01/29; doi: 10.1016/S0140-6736(12)62001-7

9. Macpherson H, Pipingas A, Pase MP. Multivitamin-multimineral supplementation and mortality: a meta-analysis of randomized controlled trials. *Am J Clin Nutr* 2013; **97**(2)**:** 437-444. e-pub ahead of print 2012/12/21; doi: 10.3945/ajcn.112.049304

10. Mursu J, Robien K, Harnack LJ, Park K, Jacobs DR, Jr. Dietary supplements and mortality rate in older women: the Iowa Women's Health Study. *Arch Intern Med* 2011; **171**(18)**:** 1625-1633. e-pub ahead of print 2011/10/12; doi: 10.1001/archinternmed.2011.445

11. Moyer VA, Force USPST. Vitamin, mineral, and multivitamin supplements for the primary prevention of cardiovascular disease and cancer: U.S. Preventive services Task Force recommendation statement. *Ann Intern Med* 2014; **160**(8)**:** 558-564. e-pub ahead of print 2014/02/26; doi: 10.7326/M14-0198

12. Savikko N, Pitkala KH, Laurila JV, Suominen MH, Tilvis RS, Kautiainen H *et al.* Secular trends in the use of vitamins, minerals and fish-oil products in two cohorts of community-dwelling older people in helsinki--population-based surveys in 1999 and 2009. *J Nutr Health Aging* 2014; **18**(2)**:** 150-154. e-pub ahead of print 2014/02/14; doi: 10.1007/s12603-013-0381-4

13. Dickinson A, Blatman J, El-Dash N, Franco JC. Consumer usage and reasons for using dietary supplements: report of a series of surveys. *J Am Coll Nutr* 2014; **33**(2)**:** 176-182. e-pub ahead of print 2014/04/15; doi: 10.1080/07315724.2013.875423

14. Kim HJ, Giovannucci E, Rosner B, Willett WC, Cho E. Longitudinal and secular trends in dietary supplement use: Nurses' Health Study and Health Professionals Follow-Up Study, 1986-2006. *J Acad Nutr Diet* 2014; **114**(3)**:** 436-443. e-pub ahead of print 2013/10/15; doi: 10.1016/j.jand.2013.07.039

15. Li K, Kaaks R, Linseisen J, Rohrmann S. Consistency of vitamin and/or mineral supplement use and demographic, lifestyle and health-status predictors: findings from the European Prospective

Investigation into Cancer and Nutrition (EPIC)-Heidelberg cohort. *Br J Nutr* 2010; **104**(7)**:** 1058-1064. e-pub ahead of print 2010/05/06; doi: 10.1017/S0007114510001728

16. Knudtson MD, Klein R, Lee KE, Reinke JO, Danforth LG, Wealti AM *et al.* A longitudinal study of nonvitamin, nonmineral supplement use: prevalence, associations, and survival in an aging population. *Ann Epidemiol* 2007; **17**(12)**:** 933-939. e-pub ahead of print 2007/09/25; doi: 10.1016/j.annepidem.2007.07.098

17. Marques-Vidal P, Pecoud A, Hayoz D, Paccaud F, Mooser V, Waeber G *et al.* Prevalence and characteristics of vitamin or dietary supplement users in Lausanne, Switzerland: the CoLaus study. *Eur J Clin Nutr* 2009; **63**(2)**:** 273-281. e-pub ahead of print 2007/10/18; doi: 10.1038/sj.ejcn.1602932

18. Firmann M, Mayor V, Vidal PM, Bochud M, Pecoud A, Hayoz D *et al.* The CoLaus study: a population-based study to investigate the epidemiology and genetic determinants of cardiovascular risk factors and metabolic syndrome. *BMC cardiovascular disorders* 2008; **8:** 6. doi: 10.1186/1471-2261-8-6

19. Christe V, Waeber G, Vollenweider P, Marques-Vidal P. Antihypertensive drug treatment changes in the general population: the CoLaus study. *BMC Pharmacol Toxicol* 2014; **15:** 20. e-pub ahead of print 2014/04/02; doi: 10.1186/2050-6511-15-20

20. Mazzaglia G, Mantovani LG, Sturkenboom MC, Filippi A, Trifiro G, Cricelli C *et al.* Patterns of persistence with antihypertensive medications in newly diagnosed hypertensive patients in Italy: a retrospective cohort study in primary care. *J Hypertens* 2005; **23**(11)**:** 2093-2100. e-pub ahead of print 2005/10/07;

21. Rautiainen S, Wang L, Gaziano JM, Sesso HD. Who uses multivitamins? A cross-sectional study in the Physicians' Health Study. *Eur J Nutr* 2014; **53**(4)**:** 1065-1072. e-pub ahead of print 2013/10/31; doi: 10.1007/s00394-013-0608-5

22. Mayer S, Osterle A. Socioeconomic determinants of prescribed and non-prescribed medicine consumption in Austria. *Eur J Public Health* 2015; **25**(4)**:** 597-603. e-pub ahead of print 2014/11/15; doi: 10.1093/eurpub/cku179

23. Rovira MA, Grau M, Castaner O, Covas MI, Schroder H, Investigators R. Dietary supplement use and health-related behaviors in a Mediterranean population. *J Nutr Educ Behav* 2013; **45**(5)**:** 386-391. e-pub ahead of print 2012/12/12; doi: 10.1016/j.jneb.2012.03.007

24. Farvid MS, Siassi F, Jalali M, Hosseini M, Saadat N. The impact of vitamin and/or mineral supplementation on lipid profiles in type 2 diabetes. *Diabetes Res Clin Pract* 2004; **65**(1)**:** 21-28. e-pub ahead of print 2004/05/28; doi: 10.1016/j.diabres.2003.11.009

25. Salonen RM, Nyyssonen K, Kaikkonen J, Porkkala-Sarataho E, Voutilainen S, Rissanen TH *et al.* Six-year effect of combined vitamin C and E supplementation on atherosclerotic progression: the Antioxidant Supplementation in Atherosclerosis Prevention (ASAP) Study. *Circulation* 2003; **107**(7)**:** 947-953. e-pub ahead of print 2003/02/26;

26. Waaseth M, Eggen AE, Grimsgaard S. Natural remedies in Scandinavia-authorization and sales. *Pharm World Sci* 2007; **29**(3)**:** 137-145. e-pub ahead of print 2007/02/13; doi: 10.1007/s11096-006-9033-7

27. Andres M, Sivera F, Falzon L, Buchbinder R, Carmona L. Dietary supplements for chronic gout. *Cochrane Database Syst Rev* 2014; **10:** CD010156. e-pub ahead of print 2014/10/08; doi: 10.1002/14651858.CD010156.pub2

28. Miller BJ, Murray L, Beckmann MM, Kent T, Macfarlane B. Dietary supplements for preventing postnatal depression. *Cochrane Database Syst Rev* 2013; **10:** CD009104. e-pub ahead of print 2013/10/26; doi: 10.1002/14651858.CD009104.pub2

29. Bath-Hextall FJ, Jenkinson C, Humphreys R, Williams HC. Dietary supplements for established atopic eczema. *Cochrane Database Syst Rev* 2012; **2:** CD005205. e-pub ahead of print 2012/02/18; doi: 10.1002/14651858.CD005205.pub3

30. Bjelakovic G, Gluud LL, Nikolova D, Bjelakovic M, Nagorni A, Gluud C. Antioxidant supplements for liver diseases. *Cochrane Database Syst Rev* 2011; (3)**:** CD007749. e-pub ahead of print 2011/03/18; doi: 10.1002/14651858.CD007749.pub2

31. Vero V, Gasbarrini A. The EFSA health claims 'learning experience'. *Int J Food Sci Nutr* 2012; **63 Suppl 1:** 14-16. e-pub ahead of print 2011/11/18; doi: 10.3109/09637486.2011.633899

32. Droz N, Marques-Vidal P. Selling dreams: an overview of slimming products' advertisements in Switzerland. *Obes Facts* 2014; **7**(5)**:** 282-288. e-pub ahead of print 2014/10/04; doi: 10.1159/000368446

33. Bunchorntavakul C, Reddy KR. Review article: herbal and dietary supplement hepatotoxicity. *Aliment Pharmacol Ther* 2013; **37**(1)**:** 3-17. e-pub ahead of print 2012/11/06; doi: 10.1111/apt.12109

34. Sood A, Ebbert JO, Prasad K, Croghan IT, Bauer B, Schroeder DR. A randomized clinical trial of St. John's wort for smoking cessation. *J Altern Complement Med* 2010; **16**(7)**:** 761-767. e-pub ahead of print 2010/07/02; doi: 10.1089/acm.2009.0445

35. Parsons A, Ingram J, Inglis J, Aveyard P, Johnstone E, Brown K *et al.* A proof of concept randomised placebo controlled factorial trial to examine the efficacy of St John's wort for smoking cessation and chromium to prevent weight gain on smoking cessation. *Drug Alcohol Depend* 2009; **102**(1-3)**:** 116-122. e-pub ahead of print 2009/03/31; doi: 10.1016/j.drugalcdep.2009.02.006

36. Kim J, Lee JS, Shin A, Kang MH, Shin DS, Chung HR *et al.* Sociodemographic and lifestyle factors are associated with the use of dietary supplements in a Korean population. *J Epidemiol* 2010; **20**(3)**:** 197-203. e-pub ahead of print 2010/04/23;

37. Reinert A, Rohrmann S, Becker N, Linseisen J. Lifestyle and diet in people using dietary supplements: a German cohort study. *Eur J Nutr* 2007; **46**(3)**:** 165-173. e-pub ahead of print 2007/03/23; doi: 10.1007/s00394-007-0650-2

38. Qato DM, Wilder J, Schumm LP, Gillet V, Alexander GC. Changes in Prescription and Over-the-Counter Medication and Dietary Supplement Use Among Older Adults in the United States, 2005 vs 2011. *JAMA Intern Med* 2016; **176**(4)**:** 473-482. e-pub ahead of print 2016/03/22; doi: 10.1001/jamainternmed.2015.8581

39. Guerra F, Stringhini S, Vollenweider P, Waeber G, Marques-Vidal P. Socio-demographic and behavioural determinants of weight gain in the Swiss population. *BMC Public Health* 2015; **15:** 73. e-pub ahead of print 2015/02/01; doi: 10.1186/s12889-015-1451-9

40. Hutchinson J, Burley VJ, Greenwood DC, Cade JE. General supplement use, subsequent use and cancer risk in the UK Women's Cohort Study. *Eur J Clin Nutr* 2014; **68**(10)**:** 1095-1100. e-pub ahead of print 2014/05/08; doi: 10.1038/ejcn.2014.85

Figure 1: selection procedure.

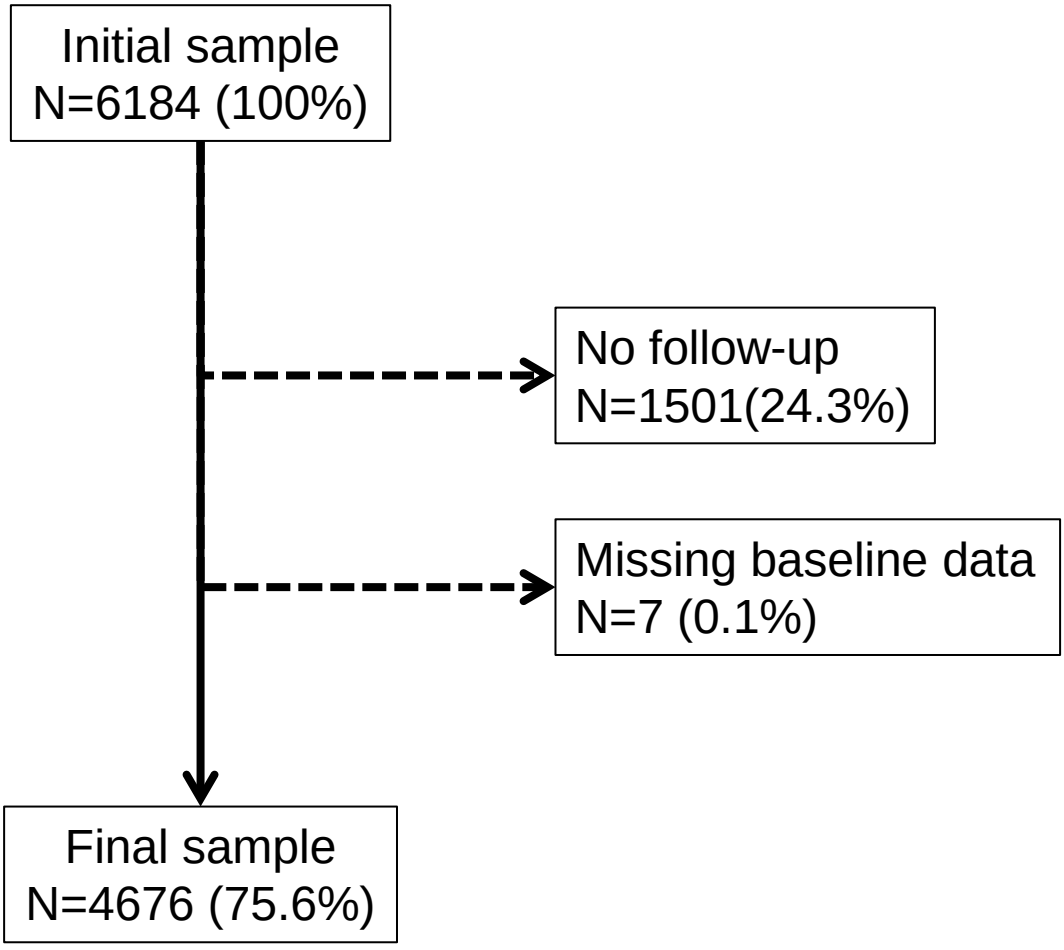

Table 1: multivariable associations between socio-demographic and clinical variables with changes in vitamin supplement use occurring between 2003-6 and 2009-12, CoLaus study, Lausanne, Switzerland, all participants.

	Initiators	**Discontinuers**	**Continuers**
N	545	559	404
Gender (man vs. woman)	0.37 (0.30 - 0.46) ***	0.38 (0.31 - 0.47) ***	0.22 (0.17 - 0.29) ***
Age groups			
[35-45[	1 (ref.)	1 (ref.)	1 (ref.)
[45-55[	1.80 (1.38 - 2.36) ***	1.04 (0.82 - 1.31)	2.09 (1.44 - 3.04) ***
[55-65[	2.25 (1.71 - 2.96) ***	0.99 (0.77 - 1.28)	4.56 (3.19 - 6.50) ***
[65+	2.36 (1.70 - 3.28) ***	1.10 (0.80 - 1.53)	6.35 (4.28 - 9.44) ***
Education			
University	1 (ref.)	1 (ref.)	1 (ref.)
High school	0.99 (0.75 - 1.31)	0.77 (0.59 - 1.01)	1.03 (0.75 - 1.42)
Apprenticeship	0.81 (0.62 - 1.06)	0.78 (0.60 - 1.00) *	0.66 (0.48 - 0.91) **
Mandatory	0.85 (0.61 - 1.17)	0.57 (0.41 - 0.78) ***	0.52 (0.35 - 0.78) ***
Marital status (married/cohab vs. other)	0.81 (0.66 - 0.98) *	0.89 (0.73 - 1.08)	0.78 (0.62 - 0.98)
Born in Switzerland vs. other country	1.16 (0.94 - 1.44)	1.04 (0.85 - 1.28)	1.23 (0.96 - 1.59)
Smoking			
Never	1 (ref.)	1 (ref.)	1 (ref.)
Former	1.05 (0.85 - 1.31)	1.21 (0.97 - 1.49)	1.29 (1.00 - 1.66)
Current	0.95 (0.75 - 1.21)	0.98 (0.78 - 1.25)	1.05 (0.79 - 1.41)
Physically active (yes vs. no)	1.30 (1.07 - 1.59) **	1.05 (0.87 - 1.28)	1.44 (1.13 - 1.82) **

BMI groups			
Normal + underweight	1 (ref.)	1 (ref.)	1 (ref.)
Overweight	0.82 (0.66 - 1.02)	0.83 (0.67 - 1.02)	0.68 (0.53 - 0.88) **
Obese	0.81 (0.60 - 1.10)	0.59 (0.42 - 0.82) **	0.65 (0.45 - 0.94) *
Hypertension (yes vs. no)	1.14 (0.91 - 1.44)	1.11 (0.87 - 1.41)	0.88 (0.67 - 1.15)
Dyslipidemia (yes vs. no)	0.89 (0.70 - 1.13)	1.08 (0.85 - 1.37)	1.34 (1.04 - 1.73) *
Diabetes (yes vs. no)	1.53 (0.99 - 2.37)	1.08 (0.65 - 1.81)	1.29 (0.75 - 2.21)

Results are expressed as relative risk ratio and (95% confidence interval). BMI, body mass index. Statistical analysis by multinomial logistic regression using never users as reference. *, $p<0.05$; **, $p<0.01$; ***, $p<0.001$.

Table 2: multivariable associations between socio-demographic and clinical variables with changes in dietary supplement use occurring between 2003-6 and 2009-12, CoLaus study, Lausanne, Switzerland, all participants.

	Initiators	**Discontinuers**	**Continuers**
N	239	405	81
Gender (man vs. woman)	0.41 (0.30 - 0.56) ***	0.30 (0.23 - 0.39) ***	0.30 (0.17 - 0.53) *
Age groups			
[35-45[	1 (ref.)	1 (ref.)	1 (ref.)
[45-55[	1.38 (0.95 - 1.99)	1.47 (1.09 - 1.97) **	2.42 (1.10 - 5.35) *
[55-65[	1.76 (1.22 - 2.55) **	1.77 (1.31 - 2.39) ***	4.53 (2.13 - 9.65) ***
[65+	1.14 (0.70 - 1.87)	1.57 (1.09 - 2.27) *	3.14 (1.29 - 7.62) **
Education			
University	1 (ref.)	1 (ref.)	1 (ref.)
High school	1.02 (0.70 - 1.49)	0.99 (0.73 - 1.35)	1.04 (0.53 - 2.03)
Apprenticeship	0.76 (0.52 - 1.10)	0.79 (0.59 - 1.07)	0.88 (0.46 - 1.68)
Mandatory	0.73 (0.45 - 1.18)	0.77 (0.53 - 1.11)	0.82 (0.36 - 1.84)
Marital status (married/cohab vs. other)	0.75 (0.57 - 0.99) *	1.07 (0.85 - 1.33)	0.81 (0.51 - 1.29)
Born in Switzerland vs. other country	1.37 (1.00 - 1.87) §	1.30 (1.02 - 1.66) *	1.23 (0.73 - 2.08)
Smoking			
Never	1 (ref.)	1 (ref.)	1 (ref.)
Former	1.22 (0.91 - 1.65)	1.31 (1.03 - 1.66) *	1.34 (0.81 - 2.21)
Current	0.75 (0.52 - 1.08)	0.92 (0.69 - 1.21)	0.88 (0.48 - 1.64)
Physically active (yes vs. no)	1.66 (1.23 - 2.24) ***	1.33 (1.06 - 1.66) *	1.84 (1.09 - 3.09) *

BMI groups			
Normal + underweight	1 (ref.)	1 (ref.)	1 (ref.)
Overweight	0.71 (0.52 - 0.98) *	1.00 (0.79 - 1.28)	0.75 (0.45 - 1.27)
Obese	0.82 (0.52 - 1.30)	0.80 (0.55 - 1.16)	0.65 (0.29 - 1.46)
Hypertension (yes vs. no)	0.77 (0.53 - 1.11)	0.91 (0.70 - 1.20)	0.96 (0.55 - 1.67)
Dyslipidemia (yes vs. no)	0.96 (0.68 - 1.35)	1.02 (0.79 - 1.33)	1.24 (0.73 - 2.10)
Diabetes (yes vs. no)	1.38 (0.69 - 2.77)	0.93 (0.51 - 1.70)	0.33 (0.04 - 2.46)

Results are expressed as relative risk ratio and (95% confidence interval). BMI, body mass index. Statistical analysis by multinomial logistic regression using never users as reference. §, $p=0.051$; *, $p<0.05$; **, $p<0.01$; ***, $p<0.001$.

ONLINE SUPPORTING MATERIAL

Supplemental table 1: comparison of baseline characteristics between included and excluded participants

	Included	Excluded	P-value
N	4676	1508	
Woman	2505 (53.6)	746 (49.5)	0.006
Age (years)	52.6 ± 10.6	54.6 ± 11.3	<0.001
Age groups (%)			<0.001
[35-45[	1362 (29.1)	384 (25.5)	
[45-55[	1365 (29.2)	393 (26.1)	
[55-65[	1288 (27.5)	418 (27.7)	
[65+	661 (14.1)	312 (20.7)	
Education (%)			<0.001
University	939 (20.1)	201 (13.4)	
High school	1185 (25.3)	283 (18.8)	
Apprenticeship	1741 (37.2)	544 (36.2)	
Mandatory	811 (17.3)	475 (31.6)	
Married/cohabiting (%)	3152 (67.4)	982 (65.3)	0.122
Born in Switzerland (%)	3164 (67.7)	838 (55.6)	<0.001
Smoking (%)			<0.001
Never	1889 (40.4)	588 (39.0)	
Former	1580 (33.8)	452 (30.0)	
Current	1207 (25.8)	466 (30.9)	
Physically active (%)	2690 (57.5)	739 (49.1)	<0.001
Body mass index (kg/m^2)	25.6 ± 4.4	26.5 ± 4.9	<0.001
BMI groups (%)			<0.001
Normal + underweight	2318 (49.6)	651 (43.2)	
Overweight	1705 (36.5)	548 (36.4)	
Obese	653 (14.0)	307 (20.4)	
Self-reported (%)			
Hypertension	1147 (24.5)	483 (32.1)	<0.001
Dyslipidemia	1087 (23.3)	383 (25.4)	0.086
Diabetes	204 (4.4)	106 (7.0)	<0.001
Vitamin supplement use (%)	963 (20.6)	274 (18.2)	0.041
Dietary supplement use (%)	486 (10.4)	128 (8.5)	0.031

Results are expressed as number of participants (percentage) or as average ± standard deviation. BMI, body mass index. Statistical analysis using chi-square or Student's t-test.

Supplemental table 2: bivariate associations between socio-demographic and clinical variables with changes in vitamin supplement use occurring between 2003-6 and 2009-12, CoLaus study, Lausanne, Switzerland.

	Never users	Initiators	Discontinuers	Continuers	P-value
N (%)	3168 (67.8)	545 (11.7)	559 (12.0)	404 (8.6)	
Woman (%)	1425 (45.0)	381 (69.9)	379 (67.8)	320 (79.2)	<0.001
Age (years)	51.6 ± 10.5 [a]	55.1 ± 10.1 [b]	51.6 ± 10.6 [a]	58.4 ± 9.4 [c]	<0.001
Age groups (%)					<0.001
[35-45[	1034 (32.6)	102 (18.7)	179 (32.0)	47 (11.6)	
[45-55[	941 (29.7)	166 (30.5)	170 (30.4)	88 (21.8)	
[55-65[	803 (25.4)	183 (33.6)	138 (24.7)	164 (40.6)	
[65+	390 (12.3)	94 (17.3)	72 (12.9)	105 (26.0)	
Education (%)					0.003
University	625 (19.7)	104 (19.1)	134 (24.0)	76 (18.8)	
High school	770 (24.3)	146 (26.8)	139 (24.9)	130 (32.2)	
Apprenticeship	1191 (37.6)	197 (36.2)	210 (37.6)	143 (35.4)	
Mandatory	582 (18.4)	98 (18.0)	76 (13.6)	55 (13.6)	
Married/cohabiting (%)	2236 (70.6)	330 (60.6)	357 (63.9)	229 (56.7)	<0.001
Born in Switzerland (%)	2094 (66.1)	387 (71.0)	385 (68.9)	298 (73.8)	0.004
Smoking (%)					0.195
Never	1266 (40.0)	233 (42.8)	225 (40.3)	165 (40.8)	
Former	1049 (33.1)	183 (33.6)	197 (35.2)	151 (37.4)	
Current	853 (26.9)	129 (23.7)	137 (24.5)	88 (21.8)	
Physically active (%)	1735 (54.8)	345 (63.3)	332 (59.4)	278 (68.8)	<0.001

Body mass index (kg/m^2)	25.9 ± 4.3 [a]	25.3 ± 4.8 [b]	24.8 ± 4.3 [b]	24.7 ± 4.5 [b]	<0.001
BMI groups (%)					<0.001
Normal + underweight	1463 (46.2)	293 (53.8)	323 (57.8)	239 (59.2)	
Overweight	1230 (38.8)	175 (32.1)	182 (32.6)	118 (29.2)	
Obese	475 (15.0)	77 (14.1)	54 (9.7)	47 (11.6)	
Self-reported (%)					
Hypertension	771 (24.3)	149 (27.3)	126 (22.5)	101 (25.0)	0.304
Dyslipidemia	727 (23.0)	120 (22.0)	120 (21.5)	120 (29.7)	0.011
Diabetes	136 (4.3)	30 (5.5)	19 (3.4)	19 (4.7)	0.377

Results are expressed as number of participants (percentage) or as mean± standard deviation. BMI, body mass index. Statistical analysis using chi-square or analysis of variance. For continuous variables, post-hoc pairwise comparisons using the method of Scheffe were performed when the results of the ANOVA were statistically significant. Results with differing subscripts are significantly different at a $p<0.05$ level (corrected for multiple comparisons).

Supplemental table 3: bivariate associations between socio-demographic and clinical variables with changes in dietary supplement use occurring between 2003-6 and 2009-12, CoLaus study, Lausanne, Switzerland.

	Never users	**Initiators**	**Discontinuers**	**Continuers**	**P-value**
N (%)	3951 (84.5)	239 (5.1%)	405 (8.7)	81 (1.7)	
Woman (%)	1959 (49.6)	174 (72.8)	308 (76.1)	64 (79.0)	<0.001
Age (years)	52.2 ± 10.6 [a]	53.7 ± 9.9 [b]	54.5 ± 10.2 [b]	56.5 ± 9.7 [b]	<0.001
Age groups (%)					<0.001
[35-45[	1211 (30.7)	56 (23.4)	86 (21.2)	9 (11.1)	
[45-55[	1152 (29.2)	71 (29.7)	121 (29.9)	21 (25.9)	
[55-65[	1034 (26.2)	83 (34.7)	134 (33.1)	37 (45.7)	
[65+	554 (14.0)	29 (12.1)	64 (15.8)	14 (17.3)	
Education (%)					0.285
University	788 (19.9)	54 (22.6)	82 (20.3)	15 (18.5)	
High school	975 (24.7)	72 (30.1)	115 (28.4)	23 (28.4)	
Apprenticeship	1482 (37.5)	82 (34.3)	146 (36.1)	31 (38.3)	
Mandatory	706 (17.9)	31 (13.0)	62 (15.3)	12 (14.8)	
Married/cohabiting (%)	2707 (68.5)	138 (57.7)	261 (64.4)	46 (56.8)	<0.001
Born in Switzerland (%)	2630 (66.6)	178 (74.5)	296 (73.1)	60 (74.1)	0.003
Smoking (%)					0.016
Never	1590 (40.2)	102 (42.7)	164 (40.5)	33 (40.7)	
Former	1302 (33.0)	91 (38.1)	155 (38.3)	32 (39.5)	
Current	1059 (26.8)	46 (19.3)	86 (21.2)	16 (19.8)	
Physically active (%)	2194 (55.5)	170 (71.1)	266 (65.7)	60 (74.1)	<0.001

Body mass index (kg/m^2)	25.8 ± 4.4 [a]	24.7 ± 4.7 [b]	24.9 ± 4.2 [b]	24.5 ± 4.7 [a, b]	<0.001
BMI groups (%)					<0.001
Normal + underweight	1897 (48.0)	148 (61.9)	224 (55.3)	49 (60.5)	
Overweight	1481 (37.5)	63 (26.4)	137 (33.8)	24 (29.6)	
Obese	573 (14.5)	28 (11.7)	44 (10.9)	8 (9.9)	
Self-reported (%)					
Hypertension	990 (25.1)	46 (19.3)	91 (22.5)	20 (24.7)	0.163
Dyslipidemia	924 (23.4)	49 (20.5)	92 (22.7)	22 (27.2)	0.612
Diabetes	180 (4.6)	10 (4.2)	13 (3.2)	1 (1.2)	NA

Results are expressed as number of participants (percentage) or as mean± standard deviation. BMI, body mass index, NA, not assessable. Statistical analysis using chi-square or analysis of variance. For continuous variables, post-hoc pairwise comparisons using the method of Scheffe were performed when the results of the ANOVA were statistically significant. Results with differing subscripts are significantly different at a $p<0.05$ level (corrected for multiple comparisons)

Supplemental table 4: bivariate associations between socio-demographic and clinical variables with changes in vitamin supplement use occurring between 2003-6 and 2009-12, CoLaus study, Lausanne, Switzerland.

	Never	Inconsistent	Consistent	P-value
N (%)	3168 (67.8)	1104 (23.6)	404 (8.6)	
Woman (%)	1425 (45.0)	760 (68.8)	320 (79.2)	<0.001
Age (years)	51.6 ± 10.5	53.3 ± 10.5	58.4 ± 9.4	<0.001
Age groups (%)				<0.001
[35-45[	1034 (32.6)	281 (25.5)	47 (11.6)	
[45-55[	941 (29.7)	336 (30.4)	88 (21.8)	
[55-65[	803 (25.4)	321 (29.1)	164 (40.6)	
[65+	390 (12.3)	166 (15.0)	105 (26.0)	
Education (%)				0.007
University	625 (19.7)	238 (21.6)	76 (18.8)	
High school	770 (24.3)	285 (25.8)	130 (32.2)	
Apprenticeship	1191 (37.6)	407 (36.9)	143 (35.4)	
Mandatory	582 (18.4)	174 (15.8)	55 (13.6)	
Married/cohabiting (%)	2236 (70.6)	687 (62.2)	229 (56.7)	<0.001
Born in Switzerland (%)	2094 (66.1)	772 (69.9)	298 (73.8)	0.002
Smoking (%)				0.095
Never	1266 (40.0)	458 (41.5)	165 (40.8)	
Former	1049 (33.1)	380 (34.4)	151 (37.4)	
Current	853 (26.9)	266 (24.1)	88 (21.8)	
Physically active (%)	1735 (54.8)	677 (61.3)	278 (68.8)	<0.001
Body mass index (kg/m^2)	25.9 ± 4.3	25.1 ± 4.6	24.7 ± 4.5	<0.001
BMI groups (%)				<0.001
Normal + underweight	1463 (46.2)	616 (55.8)	239 (59.2)	
Overweight	1230 (38.8)	357 (32.3)	118 (29.2)	
Obese	475 (15.0)	131 (11.9)	47 (11.6)	
Self-reported (%)				
Hypertension	771 (24.3)	275 (24.9)	101 (25.0)	0.906
Dyslipidemia	727 (23.0)	240 (21.7)	120 (29.7)	0.004
Diabetes	136 (4.3)	49 (4.4)	19 (4.7)	0.921

Results are expressed as number of participants (percentage) or as average ±standard deviation. BMI, body mass index. Inconsistent=initiating or discontinuing; consistent=continuing. Statistical analysis using chi-square or analysis of variance.

Supplemental table 5: multivariable associations between socio-demographic and clinical variables with changes in vitamin supplement use occurring between 2003-6 and 2009-12, CoLaus study, Lausanne, Switzerland, all participants.

	Inconsistent	**Consistent**
N	1104	404
Gender (man vs. woman)	0.38 (0.32 - 0.44) ***	0.22 (0.17 - 0.29) ***
Age groups		
[35-45[	1 (ref.)	1 (ref.)
[45-55[	1.32 (1.09 - 1.59) **	2.09 (1.44 - 3.03) ***
[55-65[	1.45 (1.19 - 1.77) ***	4.55 (3.19 - 6.50) ***
[65+	1.57 (1.22 - 2.01) ***	6.35 (4.28 - 9.44) ***
Education		
University	1 (ref.)	1 (ref.)
High school	0.87 (0.70 - 1.07)	1.02 (0.74 - 1.41)
Apprenticeship	0.79 (0.65 - 0.96) *	0.66 (0.48 - 0.91) **
Mandatory	0.69 (0.54 - 0.89) **	0.52 (0.35 - 0.77) ***
Marital status (married/cohab vs. other)	0.85 (0.73 - 0.99) *	0.78 (0.63 - 0.98) *
Born in Switzerland vs. in other country	1.10 (0.94 - 1.29)	1.23 (0.96 - 1.59)
Smoking		
Never	1 (ref.)	1 (ref.)
Former	1.13 (0.96 - 1.33)	1.29 (1.01 - 1.66)
Current	0.97 (0.81 - 1.16)	1.05 (0.79 - 1.41)
Physically active (yes vs. no)	1.17 (1.01 - 1.36) *	1.43 (1.13 - 1.82) **
BMI groups		
Normal + underweight	1 (ref.)	1 (ref.)
Overweight	0.82 (0.70 - 0.97)	0.68 (0.53 - 0.88) **
Obese	0.70 (0.55 - 0.89) **	0.64 (0.44 - 0.94) *
Hypertension (yes vs. no)	1.13 (0.94 - 1.35)	0.88 (0.67 - 1.15)
Dyslipidemia (yes vs. no)	0.98 (0.82 - 1.17)	1.34 (1.04 - 1.73) *
Diabetes (yes vs. no)	1.31 (0.92 - 1.88)	1.29 (0.75 - 2.21)

Results are expressed as relative risk ratio and (95% confidence interval). BMI, body mass index. Inconsistent=initiating or discontinuing; consistent=continuing. Statistical analysis by multinomial logistic regression using never users as reference. *, $p<0.05$; **, $p<0.01$; ***, $p<0.001$.

Supplemental table 6: bivariate associations between socio-demographic and clinical variables with changes in dietary supplement use occurring between 2003-6 and 2009-12, CoLaus study, Lausanne, Switzerland.

	Never	Inconsistent	Consistent	P-value
N (%)	3951 (84.5)	644 (13.8)	81 (1.7)	
Woman (%)	1959 (49.6)	482 (74.8)	64 (79.0)	<0.001
Age (years)	52.2 ± 10.6	54.2 ± 10.1	56.5 ± 9.7	<0.001
Age groups (%)				<0.001
[35-45[	1211 (30.7)	142 (22.1)	9 (11.1)	
[45-55[	1152 (29.2)	192 (29.8)	21 (25.9)	
[55-65[	1034 (26.2)	217 (33.7)	37 (45.7)	
[65+	554 (14.0)	93 (14.4)	14 (17.3)	
Education (%)				0.139
University	788 (19.9)	136 (21.1)	15 (18.5)	
High school	975 (24.7)	187 (29.0)	23 (28.4)	
Apprenticeship	1482 (37.5)	228 (35.4)	31 (38.3)	
Mandatory	706 (17.9)	93 (14.4)	12 (14.8)	
Married/cohabiting (%)	2707 (68.5)	399 (62.0)	46 (56.8)	0.001
Born in Switzerland (%)	2630 (66.6)	474 (73.6)	60 (74.1)	0.001
Smoking (%)				0.004
Never	1590 (40.2)	266 (41.3)	33 (40.7)	
Former	1302 (33.0)	246 (38.2)	32 (39.5)	
Current	1059 (26.8)	132 (20.5)	16 (19.8)	
Physically active (%)	2194 (55.5)	436 (67.7)	60 (74.1)	
Body mass index (kg/m^2)	25.8 ± 4.4	24.8 ± 4.4	24.5 ± 4.7	<0.001
BMI groups (%)				<0.001
Normal + underweight	1897 (48.0)	372 (57.8)	49 (60.5)	
Overweight	1481 (37.5)	200 (31.1)	24 (29.6)	
Obese	573 (14.5)	72 (11.2)	8 (9.9)	
Self-reported (%)				
Hypertension	990 (25.1)	137 (21.3)	20 (24.7)	0.117
Dyslipidemia	924 (23.4)	141 (21.9)	22 (27.2)	0.497
Diabetes	180 (4.6)	23 (3.6)	1 (1.2)	NA

Results are expressed as number of participants (percentage) or as mean±standard deviation. BMI, body mass index. Inconsistent=initiating or discontinuing; consistent=continuing. Statistical analysis using chi-square or analysis of variance.NA, not assessable.

Supplemental table 7: multivariable associations between socio-demographic and clinical variables with changes in dietary supplement use occurring between 2003-6 and 2009-12, CoLaus study, Lausanne, Switzerland, all participants.

	Inconsistent	**Consistent**
N	644	81
Gender (man vs. woman)	0.34 (0.28 - 0.41) ***	0.30 (0.17 - 0.53) ***
Age groups		
[35-45[	1 (ref.)	1 (ref.)
[45-55[	1.43 (1.13 - 1.82) **	2.42 (1.10 - 5.35) *
[55-65[	1.76 (1.38 - 2.25) ***	4.53 (2.13 - 9.65) ***
[65+	1.40 (1.03 - 1.90) *	3.14 (1.29 - 7.62) **
Education		
University	1 (ref.)	1 (ref.)
High school	1.00 (0.78 - 1.29)	1.04 (0.53 - 2.03)
Apprenticeship	0.78 (0.61 - 1.00) *	0.88 (0.46 - 1.68)
Mandatory	0.75 (0.56 - 1.02)	0.82 (0.36 - 1.84)
Marital status (married/cohab vs. other)	0.94 (0.78 - 1.12)	0.81 (0.51 - 1.29)
Born in Switzerland vs. other country	1.33 (1.09 - 1.62) **	1.23 (0.73 - 2.08)
Smoking		
Never	1 (ref.)	1 (ref.)
Former	1.28 (1.05 - 1.55) *	1.34 (0.81 - 2.21)
Current	0.85 (0.67 - 1.07)	0.88 (0.48 - 1.64)
Physically active (yes vs. no)	1.44 (1.19 - 1.73) ***	1.84 (1.09 - 3.09) *
BMI groups		
Normal + underweight	1 (ref.)	1 (ref.)
Overweight	0.89 (0.73 - 1.08)	0.75 (0.45 - 1.27)
Obese	0.81 (0.60 - 1.09)	0.65 (0.29 - 1.46)
Hypertension (yes vs. no)	0.86 (0.69 - 1.08)	0.96 (0.55 - 1.67)
Dyslipidemia (yes vs. no)	1.00 (0.80 - 1.24)	1.24 (0.73 - 2.10)
Diabetes (yes vs. no)	1.09 (0.68 - 1.74)	0.33 (0.04 - 2.46)

Results are expressed as relative risk ratio and (95% confidence interval). BMI, body mass index. Inconsistent=initiating or discontinuing; consistent=continuing. Statistical analysis by multinomial logistic regression using never users as reference. *, $p<0.05$; **, $p<0.01$; ***, $p<0.001$.