Supplementary document

Food frequency questionnaires (FFQs)

The UK FFQ was adapted from one developed for EPIC-UK [1]. It recorded consumption of 198 different foods over the last 12 months as frequencies (never to 7 days per week) and number of portions consumed on each of these days (portions size described on the questionnaire). As on the German FFQ, there were supplementary questions. The Norwegian FFQ was a translation of the UK FFQ. In Norway, the FFQ was administered at the same clinic visit as the other assessments in ECRHS II; while in the UK, participants were invited to attend the clinic on a separate occasion to complete the FFQ. In each case, the FFQ was self-administered and checked in the clinic by one of the local research team to reduce missing data.

Food frequencies were converted to intakes in grams per day (g/d). In the UK and Norway, this used portion weights from the standard UK reference [2], while in Germany portion sizes were those used for the EPIC FFQ [3].

Because the Norwegian FFQ was originally translated from the UK FFQ, it contained a number of foods not commonly eaten in Norway, hence not included in the Norwegian food tables (taramasalata, marmite, coleslaw); UK references were used for these foods where intake did occur.

Exclusions of dietary data

On the UK FFQ and Norwegian FFQ, respondents sometimes left individual items blank. This was assumed to denote zero intakes of these foods but if 20 % of items were blank, the FFQ was considered incomplete, and the subject was excluded from analyses. Participants were excluded if they had extreme values of total energy intake which might suggest an

unrealistic response: we calculated expected basal metabolic rate (BMR) with given age, weight and sex [4], and excluded subjects with a ratio of energy intake to expected BMR below the 0.5^{th} sample centile or above the 99.5^{th} sample centile for their country [5].

Validity and repeatability of FFQ

Validity and repeatability of the German FFQ were assessed in 104 men and women aged 35–64 years as part of a pilot for the EPIC study [3] and showed a fairly good reproducibility (correlation coefficient range 0.59 to 0.88 for foods and nutrients examined) and relative validity for most evaluated nutrients. Repeatability of the UK FFQ was assessed in eighty-two adults (sixty-six from the sample described in the present paper and sixteen others with asthma symptoms), using two assessments separated by an interval of 5–23 months. Validity of the UK FFQ was assessed in 263 adults, using a single 24-h dietary recall administered twice. The Norwegian FFQ was not assessed for repeatability or validity [6].

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2. (FSA) FSA. Food portion sizes. 1993.
3. Bohlscheid-Thomas S, Hoting I, Boeing H, Wahrendorf J. Reproducibility and relative validity of energy and macronutrient intake of a food frequency questionnaire developed for the German part of the EPIC project. European Prospective Investigation into Cancer and Nutrition. *Int J Epidemiol*. 1997;26 Suppl 1:S71-81.
4. Health Do. Dietary Reference Values for Food Energy and Nutrients for the United Kingdom. 1991.
5. Welch AA, Luben R, Khaw KT, Bingham SA. The CAFE computer program for nutritional analysis of the EPIC-Norfolk food frequency questionnaire and identification of extreme nutrient values. *J Hum Nutr Diet*. 2005;18:99-116.
6. Hooper R, Heinrich J, Omenaas E, Sausenthaler S, Garcia-Larsen V, Bakolis I, Burney P. Dietary patterns and risk of asthma: results from three countries in European Community Respiratory Health Survey-II. *Br J Nutr*. 2010;103:1354-65.
7. Office IL. International Standard Classification of Occupations (ISCO-88). Geneva: International Labour Organisation. 1991.

Table S1 Comparison of general characteristics of responders at ECRHS III and non-responders based on the food frequency questionnaire (FFQ) answered in ECRH II (n=1,174)

Variable	Responders at ECRHS III (730)	Non-responders at ECRHS III (444)
Age (mean age at ECRHS II in years; SD)	43.9 (6.6)	42.7 (6.7)
Sex (male)	49.8%	45.7%
SES* Managers	26%	22%
Technicians	23%	15%

Other non-manual	28%	24%
Skilled manual	10%	12%
Semi-skilled or unskilled	9%	13%
Unclassifiable	5%	14%
BMI – mean (SD)	25.8 (4.2)	25.9 (4.6)
Smoking habit		
Lifelong non-smoker	43.2%	36.5%
Ex-smoker	30.7%	26.2%
Current smoker	26.1%	37.4%
Physical activity (times per week)[&]		
Never	20.1%	25.7%
<1	13.8%	13.9%
1-3	52.1%	48.9%
>3	14.0%	11.6%

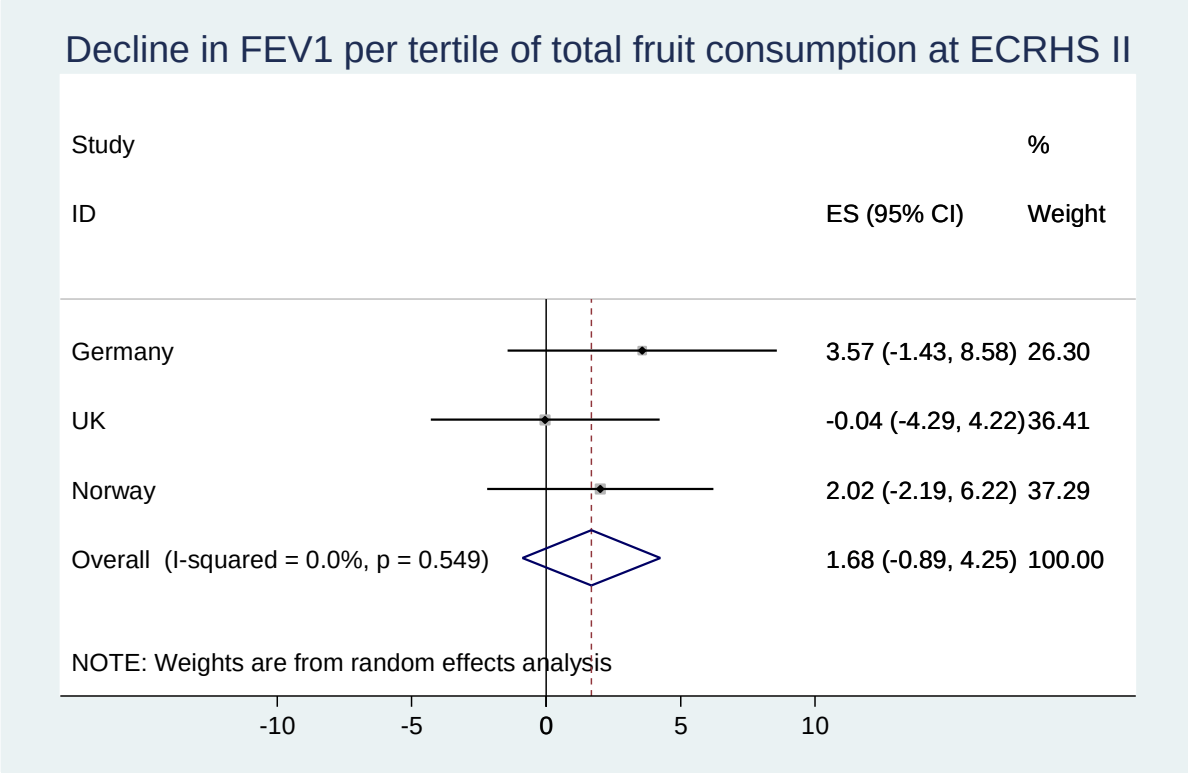
* Socio-economic status (defined according to the International Classification of Occupations) [7]

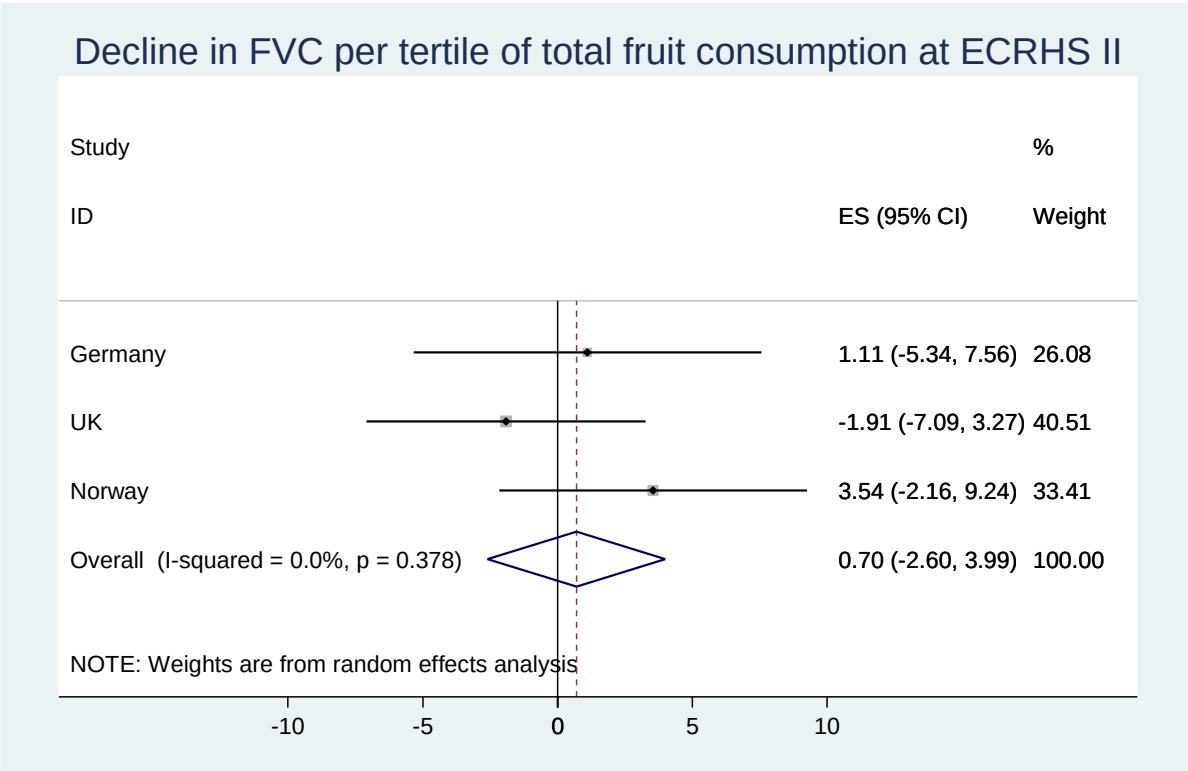
[&]Physical activity defined by answering the following question: 'How often do you exercise so much that you get out of breath or sweat?

Table S2 Range of intake per tertile of dietary exposures

Dietary exposure	Tertile	Range of intake per tertile
Total fruits (g)	1	0 - 182
	2	182 - 366
	3	370 - 4200
Apple (g)	1	0 – 14
	2	12 – 41
	3	42 - 514
Banana (g)	1	0 – 11
	2	11 – 43
	3	43 - 286
Tomato (g)	1	0 -10
	2	10 – 31
	3	31 – 300
Vitamin C (mg)	1	28 - 121
	2	122 - 229
	3	230 - 1405

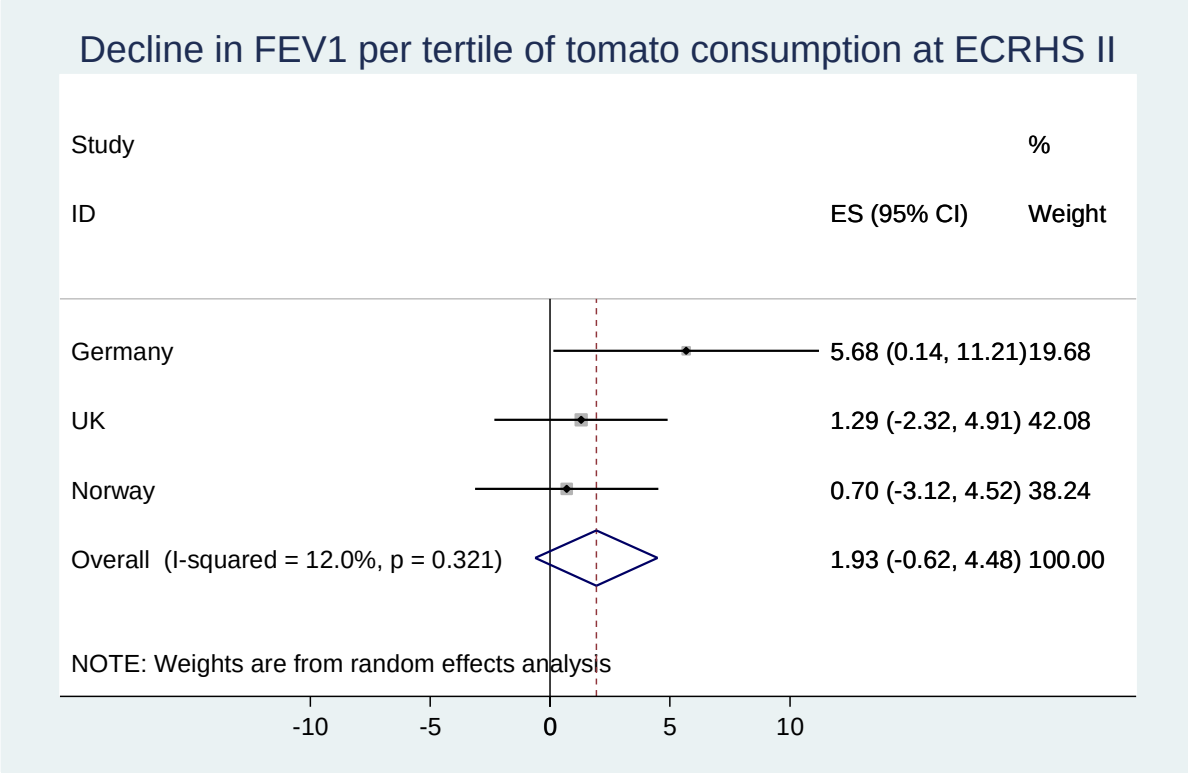
Figure S1 Meta-analysis of association between total intake of fruits and FEV_1 and FVC decline

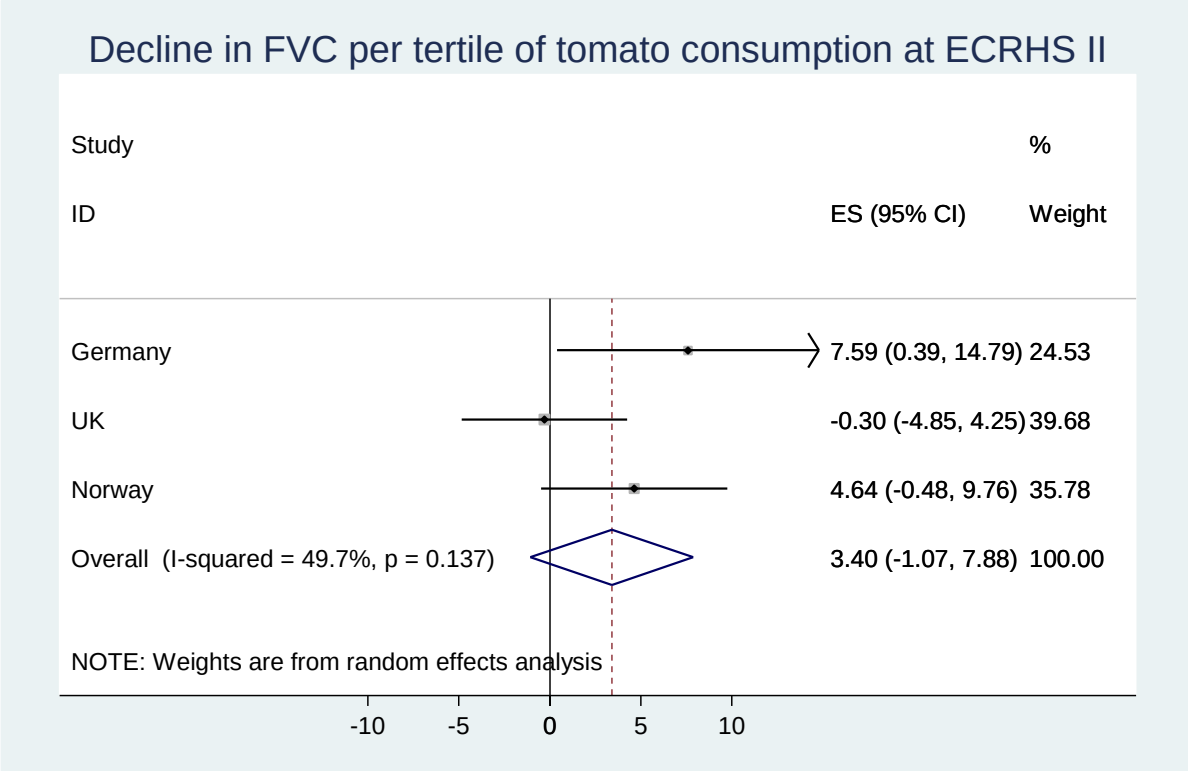




Meta-analyses adjusted by height, age, sex, smoking status, social class, BMI, TEI, years of education, and physical activity

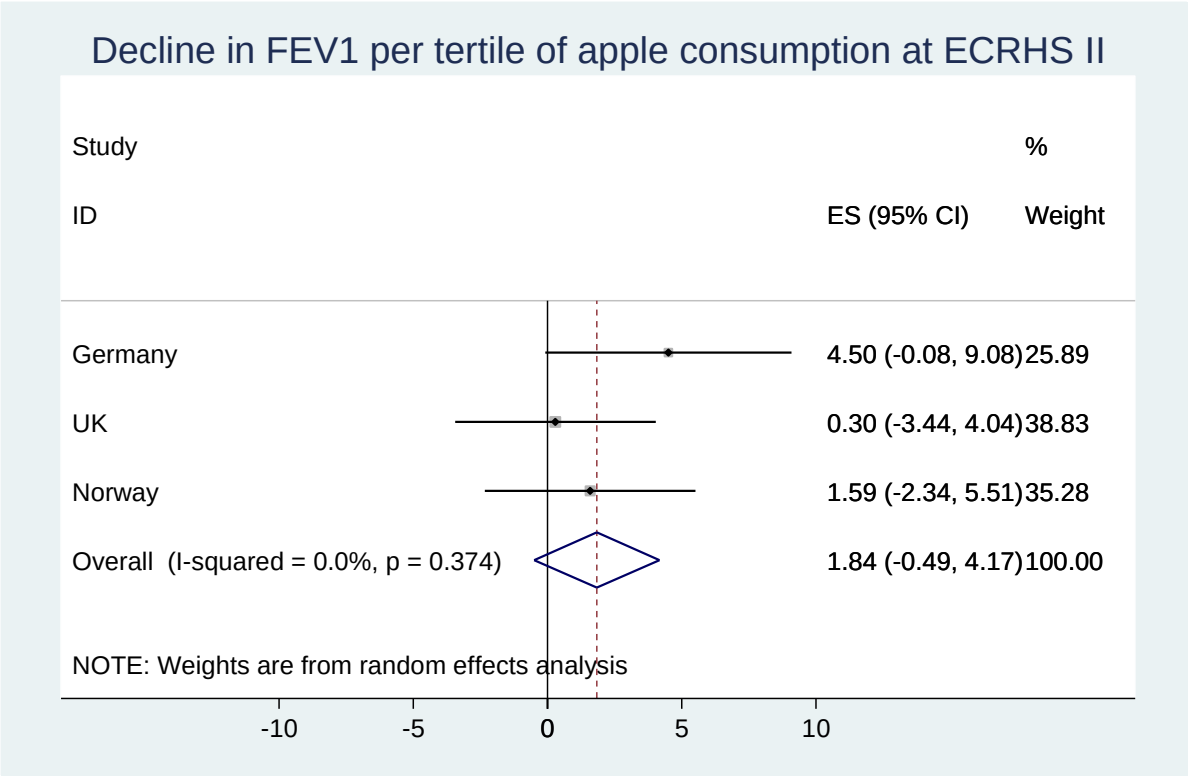
Figure S2 Meta-analysis of association between intake of tomato and FEV_1 and FVC decline

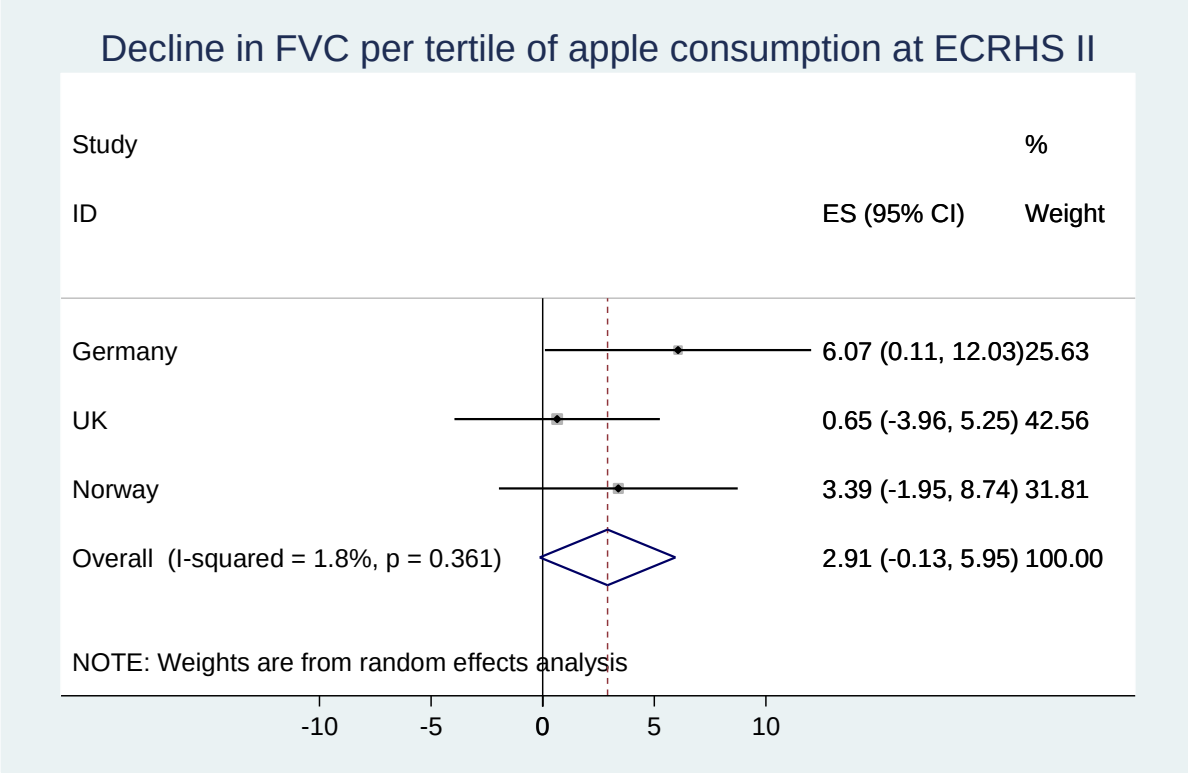




Meta-analyses adjusted by height, age, sex, smoking status, social class, BMI, TEI, years of education, and physical activity

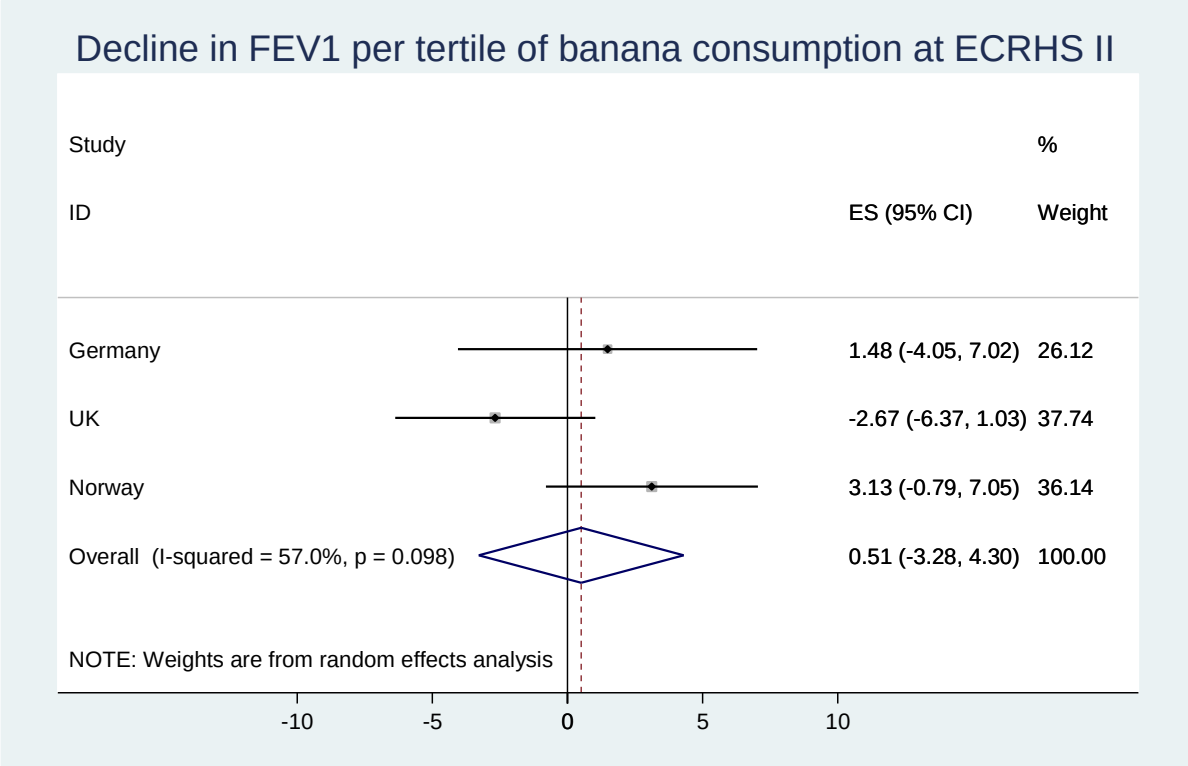
Figure S3 Meta-analysis of association between apple intake and FEV_1 and FVC decline

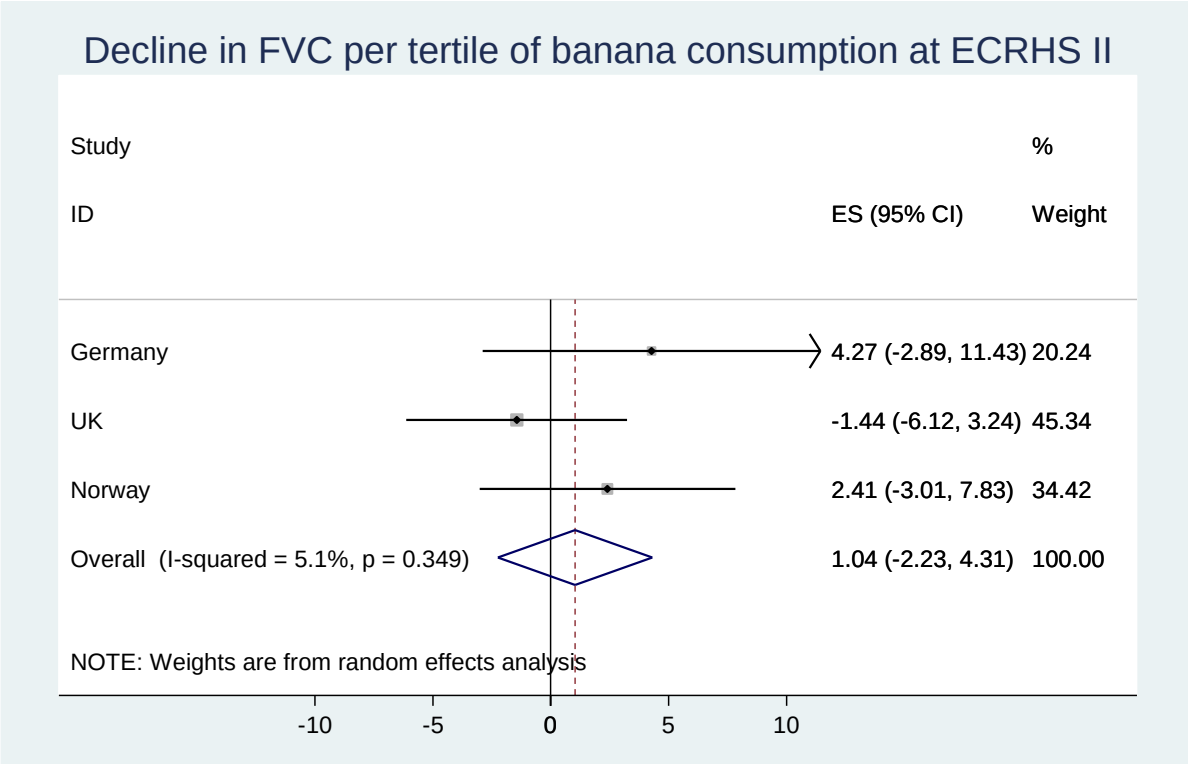




Meta-analyses adjusted by height, age, sex, smoking status, social class, BMI, TEI, years of education and physical activity

Figure S4 Meta-analysis of association between banana intake and FEV_1 and FVC decline





Meta-analyses adjusted by height, age, sex, smoking status, social class, BMI, TEI, years of education, and physical activity