SUPPLEMENTAY FILE

Leisure-time vigorous physical activity is associated with better lung function: the prospective ECRHS study

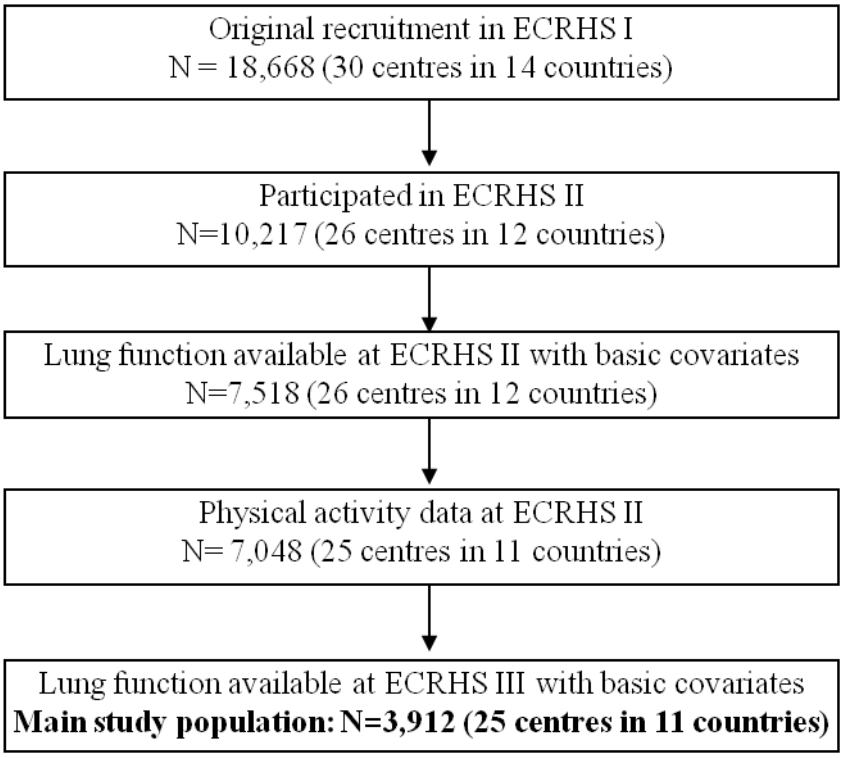

Figure S1. Flow chart of study population

Table S1. Instruments used at the first (ECRHS II) and second (ECRHS III) spirometry examination

Study centre	Year of spirometry first examination	Instrument used first examination	Year of spirometry second examination	Instrument used second examination
Albacete	2000-2001	Biomedin spiro	2011-2013	NDD
Antwerp City	2000-2002	Jaeger pneum	2013-2013	NDD
Antwerp South	2001-2002	Jaeger pneum	2013-2013	NDD
Barcelona	2000-2001	Biomedin spiro	2011-2012	NDD
Basel	2001-2002	SensorMedics hot wire	2010-2011	NDD
Bergen	2002-2002	SensorMedics displacement	2011-2012	NDD
Bordeaux	2001-2003	Vitalograph spiro	2012-2013	NDD
Erfurt	2000-2001	Jaeger pneum	2011-2012	NDD
Galdakao	2000-2001	Biomedin spiro	2011-2013	NDD
Gothenburg	2000-2001	SensorMedics displacement	2011-2012	NDD
Grenoble	2001-2002	Biomedin spiro	2011-2012	NDD
Hamburg	2000-2001	Jaeger pneum	2011-2012	NDD
Huelva	1999-2001	Biomedin spiro	2011-2012	NDD
Ipswich	1999-2001	Biomedin spiro	2012-2013	NDD
Montpellier	2001-2002	Biomedin spiro	2011-2013	NDD
Norwich	1999-2001	Biomedin spiro	2012-2013	NDD
Oviedo	2000-2001	Biomedin spiro	2011-2012	NDD
Paris	2000-2002	Biomedin spiro	2011-2012	NDD
Pavia	2000-2001	Biomedin spiro	2012-2013	NDD
Reykjavik	2000-2001	SensorMedics displacement	2012-2013	NDD
Tartu	2001-2002	Jaeger pneum	2013-2014	NDD
Turin	2000-2001	Biomedin spiro	2012-2013	Biomedin spiro
Umea	1999-2000	SensorMedics displacement	2011-2012	NDD
Uppsala	1999-2000	SensorMedics displacement	2011-2013	NDD
Verona	2000-2002	Biomedin spiro	2010-2013	Biomedin spiro

Table S2: Association estimates for all covariates included in the main analyses on the relationship between physical activity and FEV_1.

Covariates		**Frequency[a]**		**Duration[a]**		**Active status[a]**		**Change in active status[b]**	
		Mean difference (mL)	**95% CI**	**Mean difference (mL)**	**95% CI**	**Mean difference (mL)**	**95% CI**	**Mean difference (mL)**	**95% CI**
Intercept		**3176.9**	**3107.5, 3246.4**	**3170.4**	**3101.1, 3239.7**	**3166.4**	**3098.3, 3234.4**	**2977.1**	**2925.3, 3029.0**
Sex	Female	reference	reference	reference	reference	reference	reference	reference	reference
	Male	**643.5**	**600.5, 686.5**	**643.0**	**599.9, 686.0**	**645.0**	**602.0, 688.0**	**92.5**	**65.3, 119.6**
Age in years (centred)		**-28.5**	**-30.7, -26.4**	**-28.4**	**-30.6, -26.2**	**-28.3**	**-30.5, -26.2**	**-9.5**	**-10.9, -8.2**
Age^2 in years (centred)		-0.1	-0.4, 0.2	-0,.1	-0.4, 0.2	-0.1	-0.4, 0.2	0.1	-0.1, 0.2
Height in cm (centred)		**35.7**	**33.5, 38.0**	**35.7**	**33.5, 38.0**	**35.7**	**33.5, 38.0**	0.9	-0.7, 2.5
Weight in kg (centred)		**-6.3**	**-7.2, -5.4**	**-6.3**	**-7.2, -5.4**	**-6.3**	**-7.2, -5.4**	0.1	-0.6, 0.8
Smoking	Never	reference	reference	reference	reference	reference	reference	reference	reference
	Ex-smoker < 15 pack-years	11.3	-23.0, 45.6	7.2	-27.2, 41.6	9.0	-25.4, 43.4	13.5	-8.5, 35.5
	Ex-smoker >= 15 pack-years	**-98.7**	**-136.7, -60.7**	**-100.9**	**-139.0, -62.8**	**-100.3**	**-138.4, -62.3**	**-48.9**	**-78.2, -19.5**
	Current smoker < 15 pack-years	**-43.6**	**-83.7, -3.5**	**-46.6**	**-86.8, -6.5**	**-47.1**	**-87.2, -7.0**	**-62.6**	**-91.5, -33.6**
	Current smoker >= 15 pack-years	**-127.9**	**-165.6, -90.3**	**-129.7**	**-167.4, -92.1**	**-129.8**	**-167.4, -92.2**	**-112.6**	**-138.5, -86.8**
Secondhand smoke exposure at home/work	No	reference	reference	reference	reference	reference	reference	reference	reference
	yes	-11.5	-29.2, 6.1	-11.2	-28.9, 6.5	-10.6	-28.3, 7.1	-10.1	-28.9, 8.7
Age completed full time education	< 17 years	reference	reference	reference	reference	reference	reference	reference	reference
	17-20 years	**49.3**	**3.4, 95.2**	**48.4**	**2.6, 94.3**	**49.7**	**3.9, 95.5**	21.6	-4.2, 47.5
	> 20 years	**51.0**	**3.1, 98.9**	**49.2**	**1.3, 97.1**	**51.5**	**3.6, 99.3**	25.4	-1.7, 52.5
Occupation	Management/professional/non-manual	reference	reference	reference	reference	reference	reference	reference	reference
	Technical/professional/non-manual	-10.1	-53.0, 32.8	-8.9	-51.9, 34.1	-8.1	-51.0, 34.9	-18.6	-42.8, 5.6
	Other non-manual	5.1	-36.6, 46.8	8.3	-33.5, 50.1	8.1	-33.6, 49.9	-2.1	-25.6, 21.4
	Skilled manual	18.9	-37.0, 74.8	17.3	-38.6, 73.2	17.9	-37.9, 73.8	11.4	-19.9, 42.6
	Semi-skilled/unskilled manual	-11.9	-70.0, 46.2	-13.1	-71.2, 45.1	-15.1	-73.1, 42.8	9.6	-22.8, 42.1

Other/unknown	15.2	-51.3, 81.7	11.6	-55.4, 78.6	9.8	-57.1, 76.7	13.8	-24.4, 52.0
Time between follow-ups in years	**-39.4**	**-40.8, -38.0**	**-39.9**	**-41.3, -38.5**	**-39.2**	**-40.4, -38.1**	na	na
FEV_1 at first follow-up in mL	na	na	na	na	na	na	**0.8**	**0.8, 0.8**

95% CI =95% confidence intervals; FEV_1 = forced expiratory volume in one second; na = not applicable

[a] Models include a physical activity parameter, as well as adjustments for sex, age, age-squared, height, weight, smoking status, secondhand smoke exposure, education and occupation. An interaction term between time between follow-ups and the physical activity parameter was included to capture the effect of physical activity on lung function decline. Results for the effects of the physical activity parameters on lung function levels and decline (main associations of interest) are presented in Table 4 in the manuscript.

[b] Models include a physical activity parameter, as well as adjustments for sex, age, age-squared, height, weight, smoking status, secondhand smoke exposure, education, occupation and FEV_1 at the first examination.

bold: *P* value < 0.05

Table S3: Association estimates for all covariates included in the main analyses on the relationship between physical activity and FVC.

Covariates		**Frequency[a]**		**Duration[a]**		**Active status[a]**		**Change in active status[b]**	
		Mean difference (mL)	**95% CI**	**Mean difference (mL)**	**95% CI**	**Mean difference (mL)**	**95% CI**	**Mean difference (mL)**	**95% CI**
Intercept		**3968.1**	**3885.8, 4050.4**	**3970.7**	**3888.9, 4052.6**	**3963.2**	**3882.5, 4043.9**	**3899.7**	**3834.8, 3964.5**
Sex	Female	reference	reference	reference	reference	reference	reference	reference	reference
	Male	**747.5**	**698.6, 796.4**	**744.0**	**695.0, 793.0**	**746.8**	**697.8, 795.7**	**115.0**	**79.1, 151.0**
Age in years (centred)		**-26.1**	**-28.6, -23.7**	**-26.0**	**-28.4, -23.5**	**-25.9**	**-28.4, -23.5**	**-12.6**	**-14.3, -10.9**
Age^2 in years (centred)		**-0.4**	**-0.7, -0.0**	**-0.4**	**-0.7, -0.0**	**-0.4**	**-0.7, -0.0**	0.0	-0.2, 0.2
Height in cm (centred)		**54.4**	**51.8, 57.0**	**54.4**	**51.8, 56.9**	**54.4**	**51.8, 57.0**	**7.6**	**5.4, 9.8**
Weight in kg (centred)		**-8,3**	**-9.3, -7.2**	**-8.2**	**-9.3, -7.2**	**-8.2**	**-9.3, -7.2**	**-2.0**	**-2.9, -1.0**
Smoking	Never	reference	reference	reference	reference	reference	reference	reference	reference
	Ex-smoker < 15 pack-years	**40.2**	**0.6, 79.8**	34.9	-4.8, 74.6	38.3	-1.4, 78.0	13.3	-15.3, 42.0
	Ex-smoker >= 15 pack-years	-28.8	-72.9, 15.4	-32.8	-77.0, 11.4	-31.7	-75.9, 12.5	**-50.8**	**-89.0, -12.6**
	Current smoker < 15 pack-years	-5.3	-53.2, 42.6	-8.8	-56.7, 39.1	-9.0	-56.9, 38.9	**-50.0**	**-87.5, -12.6**
	Current smoker >= 15 pack-years	**-58.2**	**-102.0, -14.4**	**-60.6**	**-104.3, -16.8**	**-59.2**	**-103.0, -15.5**	**-91.4**	**-125.0, -57.8**
Secondhand smoke exposure at home/work	No	reference	reference	reference	reference	reference	reference	reference	reference
	yes	-16.4	-38.7, 5.9	-16.1	-38.5, 6.3	-15.4	-37.8, 7.0	-19.6	-43.9, 4.8
Age completed full time education	< 17 years	reference	reference	reference	reference	reference	reference	reference	reference
	17-20 years	25.7	-26.1, 77.4	22.9	-28.8, 74.6	24.4	-27.3, 76.1	**49.2**	**15.6, 82.7**
	> 20 years	38.5	-15.5, 92.5	34.9	-19.1, 88.9	37.3	-16.7, 91.3	**61.0**	**25.8, 96.1**
Occupation	Management/professional/non-manual	reference	reference	reference	reference	reference	reference	reference	reference
	Technical/professional/non-manual	-21.5	-69.7, 26.8	-19.3	-67.6, 29.0	-18.0	-66.3, 30.3	-30.6	-62.1, 0.8
	Other non-manual	1.7	-45.2, 48.6	4.7	-42.3, 51.7	4.2	-42.8, 51.2	-1.0	-31.6, 29.5
	Skilled manual	25.1	-37.7, 88.0	24.5	-38.3, 87.4	26.3	-36.4, 89.1	19.3	-21.4, 59.9
	Semi-skilled/unskilled manual	-28.0	-93.5, 37.4	-30.9	-96.4, 34.5	-31.1	-96.4, 34.2	25.4	-17.0, 67.8

Other/unknown	5.9	-68.9, 80.6	1.0	-74.3, 76.3	0.9	-74.5, 76.2	2.6	-46.8, 52.1
Time between follow-ups	**-27.9**	**-29.7, -26.1**	-29.0	**-30.8, -27.2**	**-27.9**	**-29.4, -26.4**	na	na
FVC at first follow-up in mL	na	na	na	na	na	na	**0.8**	**0.8, 0.8**

95% CI =95% confidence intervals; FVC= forced vital capacity; na = not applicable

[a] Models include a physical activity parameter, as well as adjustments for sex, age, age-squared, height, weight, smoking status, secondhand smoke exposure, education and occupation. An interaction term between time between follow-ups and the physical activity parameter was included to capture the effect of physical activity on lung function decline. Results for the effects of the physical activity parameters on lung function levels and decline (main associations of interest) are presented in Table 4 in the manuscript.

[b] Models include a physical activity parameter, as well as adjustments for sex, age, age-squared, height, weight, smoking status, secondhand smoke exposure, education, occupation and FVC at the first examination.

bold: *P* value < 0.05

Table S4. Associations between vigorous physical activity and the FEV_1/FVC ratio

	Vigorous physical activity levels		FEV₁/FVC		
			N	**Mean difference**	**95% CI**
Association with lung function[a]	Frequency	<= 1 a month	3869	reference	
		1-3 times a week		-0.13	-0.57, 0.30
		> 4 times a week		**-1.10**	**-1.73, -0.47**
	Duration (per week)	<= 30 minutes	3839	reference	
		1-3 hours		0.08	-0.37, 0.52
		>= 4 hours		**-0.68**	**-1.27, -0.09**
	Active	>= 2 times a week and >=1 hour	3837	-0.16	-0.57, 0.26
Change in physical activity status on lung function at the second examination[b]	Remained non-active		3518	reference	
	Became inactive			0.34	-0.07, 0.76
	Became active			0.13	-0.25, 0.50
	Remained active			**0.47**	**0.10, 0.84**

95% CI =95% confidence intervals; FEV_1 = forced expiratory volume in one second; FVC = forced vital capacity; N = number of participants included in the model

[a] adjusted for sex, age, age-squared, height, weight, smoking status, secondhand smoke exposure, education and occupation. A positive estimate suggests that those more active at the first examination had higher average lung function at both examinations than those less active.

[c] adjusted for sex, age, age-squared, height, weight, smoking status, secondhand smoke exposure, education, occupation and lung function at first examination. A positive estimate suggests better lung function on average at the second examination

bold: *P* value < 0.05

Table S5. Associations between vigorous physical activity and forced expiratory volume in one second, stratified by smoking status at the first examination

Vigorous physical activity levels		Never smokers			Ex-smokers			Current smokers		
		N	**Mean difference (mL)**	**95% CI**	**N**	**Mean difference (mL)**	**95% CI**	**N**	**Mean difference (mL)**	**95% CI**
Association with lung function[a]										
Frequency	<= 1 a month	1784	reference		1129	reference		974	reference	
	1-3 times a week		1.34	-46.9, 49.6		-39.2	-103.4, 25.0		**74.3**	**10.5, 138.1**
	> 4 times a week		-44.3	-112.4, 23.9		33.9	-59.9, 127.7		68.9	-24.9, 162.7
Duration (per week)	<= 30 minutes	1766	reference		1117	reference		974	reference	
	1-3 hours		0.3	-47.9, 48.5		-39.3	-105.6, 27.0		**88.0**	**22.7, 153.2**
	>= 4 hours		-30.7	-97.6, 36.2		44.6	-38.0, 127.3		**109.0**	**18.8, 199.1**
Active	>= 2 times a week and >=1 hour	1766	10.0	-34.6, 54.6	1115	21.2	-39.2, 81.6	974	**117.2**	**53.9, 180.5**
Change in physical activity status on lung function at the second examination[b]										
Remained non-active		1670	reference		1073	reference		951	reference	
Became inactive			**36.6**	**0.3, 72.9**		-33.0	-78.6, 12.6		5.9	-44.4, 56.2
Became active			**45.8**	**11.9, 79.6**		29.8	-9.9, 69.6		43.7	-1.4, 88.7
Remained active			**40.0**	**8.3, 71.6**		**42.3**	**2.4, 82.3**		26.9	-21.1, 75.0

95% CI =95% confidence intervals; N = number of participants included in the model

[a] adjusted for sex, age, age-squared, height, secondhand smoke exposure, education, occupation and lifetime pack-years smoked. A positive estimate suggests that those more active at the first examination had higher average lung function at both examinations than those less active.

[b] adjusted for sex, age, age-squared, height, secondhand smoke exposure, education, occupation, lifetime pack-years smoked and lung function at first examination. A positive estimate suggests better lung function on average at the second examination

bold: *P* value < 0.05

Table S6. Associations between vigorous physical activity and forced vital capacity, stratified by by smoking status at the first examination

Vigorous physical activity levels		Never smokers			Ex-smokers			Current smokers		
		N	**Mean difference (mL)**	**95% CI**	**N**	**Mean difference (mL)**	**95% CI**	**N**	**Mean difference (mL)**	**95% CI**
Association with lung function[a]										
Frequency	<= 1 a month	1782	reference		1121	reference		970	reference	
	1-3 times a week		3.0	-52.8, 58.8		-36.8	-109.0, 35.3		**88.6**	**13.8, 163.4**
	> 4 times a week		12.1	-66.8, 91.0		41.2	-63.9, 146.3		**163.8**	**53.4, 274.1**
Duration (per week)	<= 30 minutes	1764	reference		1109	reference		970	reference	
	1-3 hours		5.8	-50.1, 61.7		-66.1	-140.6, 8.4		**91.4**	**14.9, 167.8**
	>= 4 hours		9.1	-68.1, 86.3		51.0	-41.5, 143.5		**187.7**	**81.8, 293.6**
Active	>= 2 times a week and >=1 hour	1764	29.6	-22.1, 81.3	1107	8.8	-59.0, 76.6	970	**146.4**	**72.2, 220.7**
Change in physical activity status on lung function at the second examination[b]										
Remained non-active		1610	reference		1050	reference		924	reference	
Became inactive			37.7	-9.6, 85.0		-32.9	-92.8, 27.0		-5.0	-70.5, 60.5
Became active			**69.7**	**25.6, 113.8**		26.2	-26.0, 78.4		**76.0**	**17.5, 134.5**
Remained active			33.1	-8.1, 74.2		54.2	**2.2, 106.2**		**14.2**	**-47.4, 75.8**

95% CI =95% confidence intervals; N = number of participants included in the model

[a] adjusted for sex, age, age-squared, height, secondhand smoke exposure, education, occupation and lifetime pack-years smoked. A positive estimate suggests that those more active at the first examination had higher average lung function at both examinations than those less active.

[b] adjusted for sex, age, age-squared, height, smoking status, secondhand smoke exposure, education, occupation, lifetime pack-years smoked and lung function at first examination. A positive estimate suggests better lung function on average at the second examination

bold: *P* value < 0.05

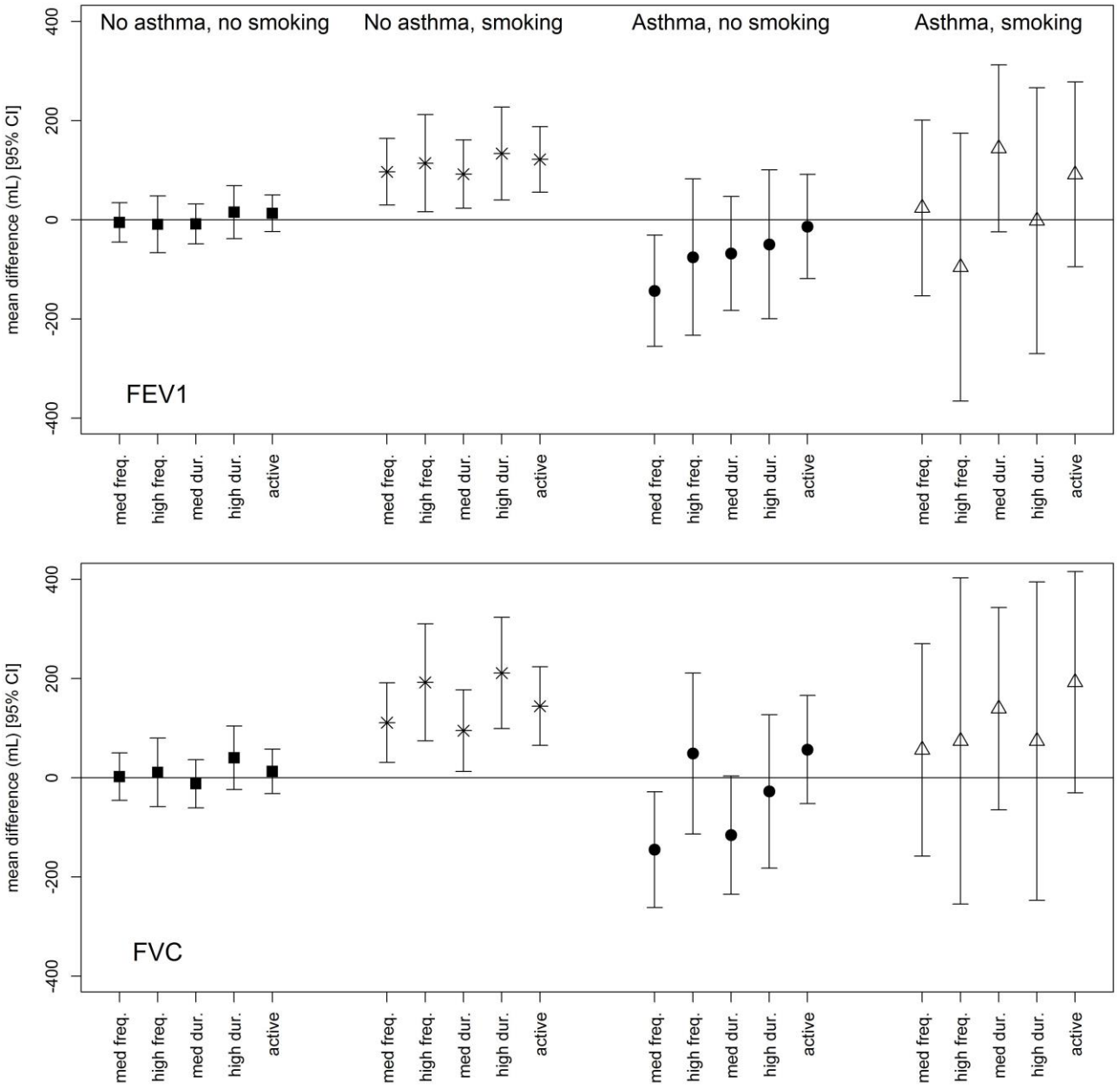

Figure S2. Associations between physical activity variables at the first examination and lung function, stratified by asthma status and smoking behaviour. All models are adjusted for sex, age, age-squared, height, weight, secondhand smoke exposure, education, occupation and lifetime pack-years smoked.

Filled squares = no asthma and no current smoking; stars = no asthma and current smoking; filled circles = asthma and no current smoking; open triangles: asthma and current smoking. For frequency, low: <= 1 a month; med: 1-3 times a week; high: > 4 times a week. For duration, low: <=30 minutes; med: 1-3 hours; high: >= 4 hours. Active: >= 2 times and >= 1 hour per week.

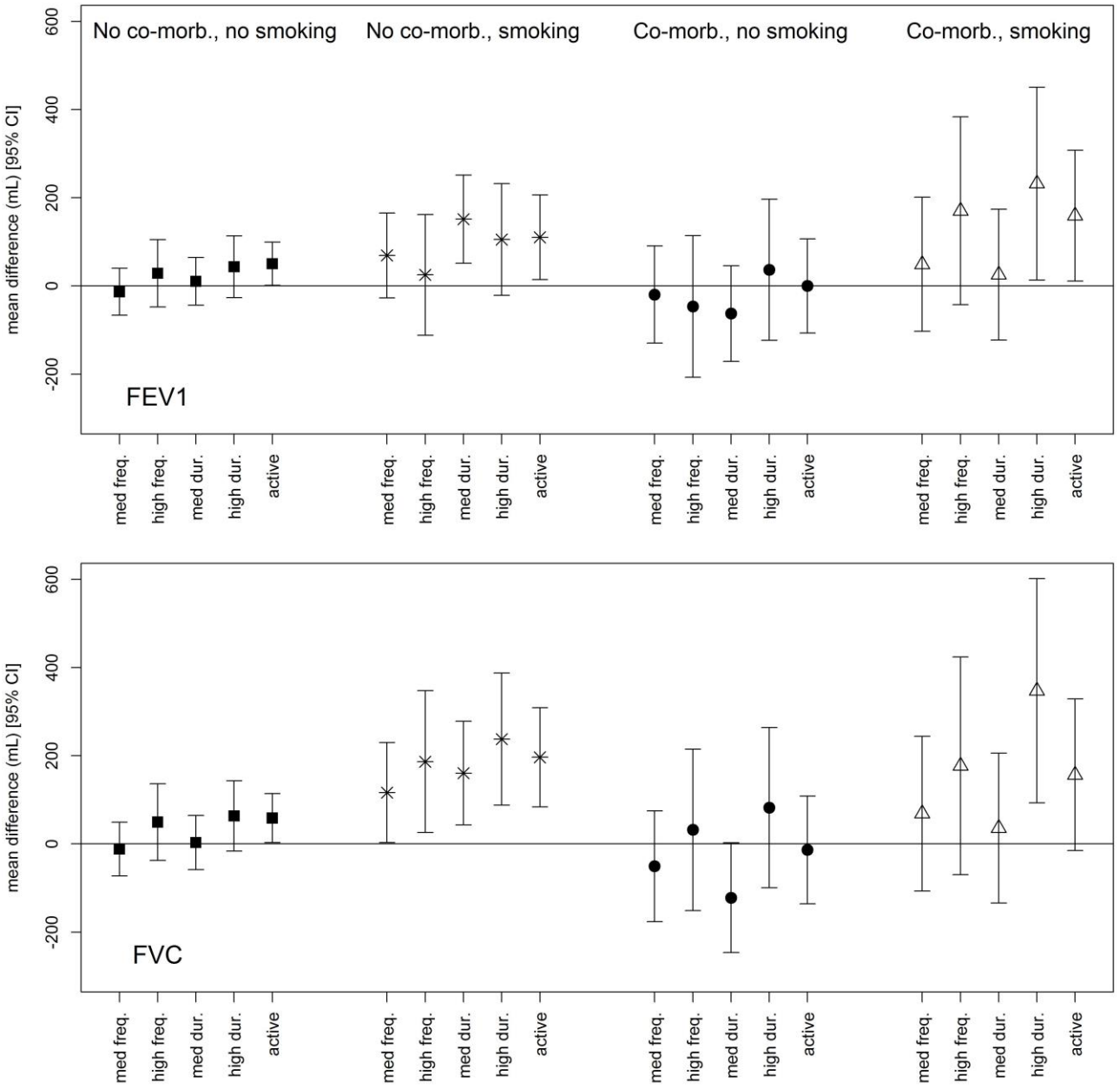

Figure S3. Associations between vigorous physical activity variables at the first examination and lung function, stratified by co-morbidity status and smoking behaviour. All models are adjusted for sex, age, age-squared, height, weight, secondhand smoke exposure, education, occupation and lifetime pack-years smoked.

Filled squares = no co-morbidity and no current smoking; stars = no co-morbidity and current smoking; filled circles = co-morbidity and no current smoking; open triangles: co-morbidity and current smoking. For frequency, low: <= 1 a month; med: 1-3 times a week; high: > 4 times a week. For duration, low: <= 30 minutes; med: 1-3 hours; high: >= 4 hours. Active: >= 2 times and >= 1 hour per week.

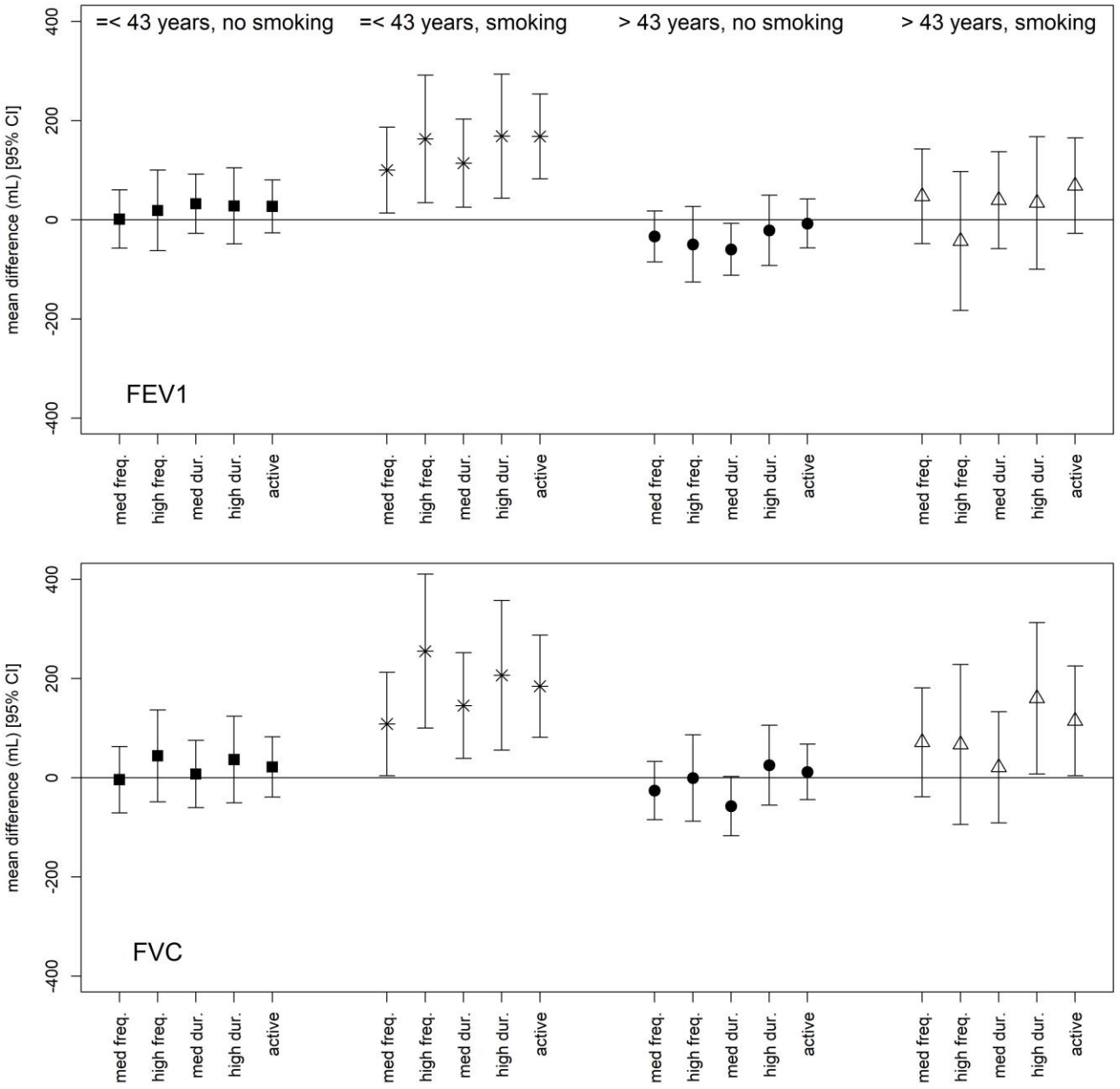

Figure S4. Associations between vigorous physical activity variables at the first examination and lung function, stratified by the median age at the first follow-up and smoking behaviour. All models are adjusted for sex, age at first follow-up, age-squared at first follow-up, height, weight, secondhand smoke exposure, education, occupation and lifetime pack-years smoked.

Filled squares = less than or equal to 43 years of age and no current smoking; stars = less than or equal to 43 years of age and current smoking; filled circles = great than 43 years of age and no current smoking; open triangles: greater than 43 years of age and current smoking. For frequency, low: <= 1 a month; med: 1-3 times a week; high: > 4 times a week. For duration, low: <= 30 minutes; med: 1-3 hours; high: >= 4 hours. Active: >= 2 times and >= 1 hour per week.

Table S7. Associations between vigorous physical activity and lung function, stratified by sex

Vigorous physical activity levels		FEV_1 (mL)						FVC (mL)					
		Males			Females			Males			Females		
		N	Mean difference	95% CI	N	Mean difference	95% CI	N	Mean difference	95% CI	N	Mean difference	95% CI
Association with lung function[a]													
Frequency	<= 1 a month	1900	reference		1987	reference		1892	reference		1980	reference	
	1-3 times a week		-2.2	-57.3, 52.9		20.4	-17.8, 58.5		29.1	-32.9, 91.2		2.2	-42.0, 46.5
	> 4 times a week		7.1	-74.3, 88.4		9.1	-44.9, 63.1		80.3	-11.6, 172.2		39.6	-22.9, 102.0
Duration	<= 30 minutes	1889	reference		1968	reference		1881	reference		1961	reference	
	1-3 hours		14.6	-42.1, 71.3		16.3	-22.0, 54.6		28.1	-35.8, 92.1		-4.8	-49.2, 39.6
	>= 4 hours		39.8	-32.4, 112.0		8.5	-45.4, 62.4		**94.9**	**13.5, 176.2**		27.4	-34.8, 89.7
Active	>= 2 times a week and >=1 hour	1888	**54.6**	**2.5, 106.6**	1967	20.0	-16.3, 56.3	1880	**79.9**	**21.3, 138.6**	1960	20.3	-21.8, 62.3
Change in physical activity status on lung function at the second examination[b]													
Remained non-active		1804	reference		1890	reference		1743	reference		1841	reference	
Became inactive			6.0	-36.3, 48.4		5.0	-22.5, 32.6		4.3	-50.6, 59.3		-0.4	-36.4, 35.7
Became active			29.8	-5.9, 65.5		**42.6**	**15.8, 69.4**		**57.9**	**11.0, 104.8**		**48.0**	**13.3, 82.8**
Remained active			**36.3**	**1.5, 71.2**		**43.7**	**16.9, 70.6**		41.4	-4.1, 86.8		**34.8**	**0.2, 69.3**

95% CI =95% confidence intervals; FEV_1 = forced expiratory volume in one second; FVC = forced vital capacity; N = number of participants included in the model

[a] adjusted for age, age-squared, height, weight, smoking status, secondhand smoke exposure, education and occupation. A positive estimate suggests that those more active at the first examination had higher average lung function at both examinations than those less active.

[b] adjusted for age, age-squared, height, weight, smoking status, secondhand smoke exposure, education, occupation and lung function at first examination. A positive estimate suggests better lung function on average at the second examination

bold: *P* value < 0.05

Table S8. Associations between vigorous physical activity and forced expiratory volume in one second, stratified by body mass index

Vigorous physical activity levels		< 25 kg/m^2			25 - 30 kg/m^2			> 30 kg/m^2		
		N	Mean difference (mL)	95% CI	N	Mean difference (mL)	95% CI	N	Mean difference (mL)	95% CI
Association with lung function[a]										
Frequency	<= 1 a month	1966	reference		1394	reference		510	reference	
	1-3 times a week		3.2	-42.2, 48.7		37.5	-18.5, 93.5		-25.4	-128.0, 77.2
	> 4 times a week		6.6	-60.4, 73.6		46.4	-34.7, 127.4		-61.1	-197.2, 75.1
Duration (per week)	<= 30 minutes	1954	reference		1383	reference		503	reference	
	1-3 hours		17.2	-28.7, 63.2		33.7	-23.7, 91.2		-43.7	-148.3, 60.8
	>= 4 hours		36.7	-25.2, 98.6		66.2	-9.8, 142.3		-32.0	-166.4, 102.4
Active	>= 2 times a week and >=1 hour	1952	**50.2**	**7.4, 93.0**	1383	51.1	-1.8, 104.1	503	-40.1	-137.5, 57.3
Change in physical activity status on lung function at the second examination[b]										
Remained non-active		1867	reference		1344	reference		483	reference	
Became inactive			8.3	-22.4, 39.1		9.9	-34.0, 53.8		7.3	-77.1, 91.8
Became active			16.3	-12.1, 44.8		**56.4**	**17.8, 94.9**		75.9	0.0, 151.7
Remained active			**39.6**	**12.0, 67.2**		31.3	-6.7, 69.2		57.6	-21.6, 136.8

95% CI =95% confidence intervals; N = number of participants included in the model

[a] adjusted for sex, age, age-squared, height, smoking status, secondhand smoke exposure, education and occupation. A positive estimate suggests that those more active at the first examination had higher average lung function at both examinations than those less active.

[b] adjusted for sex, age, age-squared, height, smoking status, secondhand smoke exposure, education, occupation and lung function at first examination. A positive estimate suggests better lung function on average at the second examination

bold: *P* value < 0.05

Table S9. Associations between vigorous physical activity and forced vital capacity, stratified by body mass index

Vigorous physical activity levels		< 25 kg/m^2			25 - 30 kg/m^2			> 30 kg/m^2		
		N	**Mean difference (mL)**	**95% CI**	**N**	**Mean difference (mL)**	**95% CI**	**N**	**Mean difference (mL)**	**95% CI**
Association with lung function[a]										
Frequency	<= 1 a month	1957	reference		1392	reference		507	reference	
	1-3 times a week		15.4	-36.2, 67.1		34.6	-31.7, 100.9		18.8	-128.0, 90.4
	> 4 times a week		64.5	-11.5, 140.6		76.4	-19.8, 172.6		0.7	-144.0, 145.5
Duration (per week)	<= 30 minutes	1945	reference		1381	reference		500	reference	
	1-3 hours		15.7	-36.6, 67.9		27.1	-41.1, 95.3		-56.1	-167.2, 54. 9
	>= 4 hours		66.6	-3.8, 136.9		84.9	-5.0, 174.7		46.7	[-96.2, 189.6
Active	>= 2 times a week and >=1 hour	1943	**66.0**	**17.3, 114.7**	1381	53.9	-9.0, 116.7	500	-29.8	-133.5, 73.8
Change in physical activity status on lung function at the second examination[b]										
Remained non-active		1814	reference		1304	reference		466	reference	
Became inactive			8.6	-32.1, 49.3		18.2	-40.0, 76.5		-28.0	-130.3, 74.2
Became active			27.1	-10.7, 64.8		**80.1**	**28.5, 131.8**		**98.3**	**8.1, 188.5**
Remained active			26.6	-9.8, 63.0		45.6	-4.6, 95.8		48.7	-45.5, 142.9

95% CI =95% confidence intervals; N = number of participants included in the model

[a] adjusted for sex, age, age-squared, height, smoking status, secondhand smoke exposure, education and occupation. A positive estimate suggests that those more active at the first examination had higher average lung function at both examinations than those less active.

[b] adjusted for sex, age, age-squared, height, smoking status, secondhand smoke exposure, education, occupation and lung function at first examination. A positive estimate suggests better lung function on average at the second examination

bold: *P* value < 0.05

Table S10. Associations (beta 95% CI) between vigorous physical activity and lung function, adjusted for lung function assessed at baseline

Vigorous physical activity levels		**FEV$_1$ (mL)**			**FVC (mL)**	
		N	**Mean difference**	**95% CI**	**N**	**Mean difference**	**95% CI**
Association with lung function[a]							
Frequency	<= 1 a month	3560	reference		3490	reference	
	1-3 times a week		-9.8	-30.9, 11.3		9.2	-15.2, 33.7
	> 4 times a week		-3.1	-34.1, 27.8		28.3	-7.7, 64.3
Duration (per week)	<= 30 minutes	3533	reference		3465	reference	
	1-3 hours		-10.8	-32.4, 10.8		-0.8	-25.9, 24.2
	>= 4 hours		-1.6	-30.5, 27.3		21.6	-11.9, 55.0
Active	>= 2 times a week and >=1 hour per week	3531	9.0	-11.1, 29.2	3463	**26.5**	**3.1, 49.9**
Change in physical activity status on lung function at the second examination[b]							
Remained non-active		3393	reference		3248	reference	
Became inactive			6.7	-18.5, 32.0		-4.5	-36.2, 27.3
Became active			**36.8**	**14.2, 59.4**		**50.6**	**22.3, 79.0**
Remained active			**37.6**	**15.2, 59.9**		**32.6**	**4.5, 60.7**

95% CI =95% confidence intervals; FEV$_1$ = forced expiratory volume in one second; FVC = forced vital capacity; N = number of participants included in the model

[a] adjusted for sex, age, age-squared, height, weight, smoking status, secondhand smoke exposure, education and occupation and lung function at baseline (ECRHS I). A positive estimate suggests that those more active at the first examination had higher average lung function at both examinations than those less active.

[b] adjusted for sex, age, age-squared, height, weight, smoking status, secondhand smoke exposure, education, occupation and lung function at first examination (ECRHS II) and at baseline (ECRHS I). A positive estimate suggests better lung function on average at the second examination

bold: *P* value < 0.05