

Supplementary Material for

**Combined impact of healthy lifestyle factors on risk of asthma,
rhinoconjunctivitis, and eczema in school children: ISAAC Phase
Three**

Table S1. Number of centres and children per country, and prevalence of wheeze, asthma, rhinoconjunctivitis and eczema, the ISAAC Phase Three.

Region of the world, country, centre	N	Healthy lifestyle index					Current wheeze (%)	Asthma ever (%)	Eczema ever (%)	Hay fever ever (%)	Current symptoms of rhinoconjunctivitis (%)	Current symptoms of eczema (%)
		mean	points (%)									
			0 or 1	2	3	4 or 5						
Oceania	3401											
New Zealand												
Auckland	1433	2.64	12.6	30.4	39.1	18.0	20.0	6.3	28.1	16.4	11.9	12.3
Christchurch	1968	2.95	7.2	24.1	40.0	28.7	21.6	31.2	41.5	21.8	15.1	20.0
Western Europe	21002											
Spain												
Cartagena	1850	2.32	22.9	34.8	28.8	13.5	11.3	11.0	31.7	7.9	9.7	4.8
Barcelona	2586	2.84	6.9	29.6	40.7	22.8	8.4	12.0	25.1	8.6	4.0	4.0
Bilbao	2502	2.75	12.9	28.7	33.2	25.2	11.8	20.7	33.1	9.1	9.7	6.9
Valencia	2290	2.60	15.1	32.5	32.0	20.4	9.2	8.4	32.3	6.9	8.3	5.6
Madrid	1703	2.59	14.5	33.6	31.7	20.2	9.2	10.2	34.8	10.8	12.2	6.0
Asturias	2465	2.74	12.6	28.6	34.4	24.4	11.2	15.0	32.5	13.5	12.1	6.6
A Coruña	2103	2.60	15.3	31.0	33.8	19.9	11.4	13.9	37.7	13.6	12.5	7.0
Portugal												
Lisbon	1419	2.59	14.5	32.0	33.9	19.6	15.4	7.4	17.8	2.6	12.5	12.1
Porto	1180	2.69	13.8	29.2	32.8	24.2	8.8	9.1	11.8	2.8	7.6	9.1
Belgium												
Antwerp	2904	2.57	13.7	34.2	34.1	18.0	7.1	5.8	25.6	5.5	7.0	13.1
Northern and Eastern Europe	8478											
Estonia												
Tallin	1679	2.47	17.0	33.0	35.1	14.9	10.3	5.4	10.1	3.8	4.9	11.9
Poland												
Poznan	1169	2.48	17.6	34.1	31.5	16.8	13.2	5.7	35.7	19.9	NA	14.4

	Krakow	1813	2.67	12.9	30.3	35.4	21.4	14.7	5.6	30.3	22.3	17.4	10.9
	Hungary												
	Svabhegy	2402	2.08	30.9	35.9	23.0	10.1	6.4	4.8	9.9	5.2	5.8	4.6
	Lithuania												
	Kaunas	1415	1.92	33.3	41.8	20.1	4.8	6.7	2.8	4.2	3.1	4.7	3.6
Eastern Mediterranean		9474											
	Iran												
	Tehran	1083	2.22	20.4	41.6	30.7	7.3	7.6	1.7	13.5	1.9	2.4	1.1
	Rasht	1481	2.36	16.3	38.3	37.5	7.8	15.0	7.5	13.8	1.8	2.8	1.8
	Oman												
	Al-Khod	2789	2.98	4.8	25.1	41.1	28.9	7.6	9.9	7.1	4.7	7.1	4.5
	Syria												
	Lattakia	1999	2.27	21.7	38	29.2	11.2	4.8	4.0	2.3	4.1	4.3	2.2
	Tartous	2122	2.02	27.9	43.9	23.2	4.9	5.4	4.3	4.9	8.6	5.4	1.6
Latin America		19825											
	Chile												
	South Santiago	1494	2.19	25.1	38.1	26.8	10.0	14.7	8.5	19.4	14.9	15.8	15.6
	Punta Arenas	1801	2.20	23.9	38.7	27.5	9.9	17.8	7.3	35.3	16.9	14.6	12.9
	Colombia												
	Bogota	1197	2.78	8.9	29.1	38.3	23.8	10.5	6.0	9.3	19.5	19.4	15.3
	Barranquilla	1512	2.71	9.5	27.0	46.5	16.9	14.1	11.5	16.2	22.2	16.6	20.1
	Mexico												
	Monterrey	1486	2.38	19.4	34.1	33.3	13.2	9.4	6.4	2.7	8.2	8.6	3.8
	Mérida	1940	2.31	20	38.9	29.8	11.3	13.3	13.0	7.3	13.7	18.1	8.2
	Ciudad Victoria	1031	2.55	13.8	33.3	35.5	17.4	8.8	5.2	2.3	5.1	NA	2.2
	Ciudad de Mexico (1)	1943	2.42	18.3	33.2	35.7	12.8	7.4	4.8	5.0	4.9	22.5	9.8
	Ciudad de Mexico (3)	3411	2.57	13.1	32.8	38.2	15.9	3.5	2.2	2.3	3.9	24.7	8.3
	Toluca	2665	2.62	14.6	29.0	35.4	21.0	5.7	2.1	3.8	4.7	8.4	6

	Venezuela												
	Caracas	1345	2.37	18.9	34.7	34	12.3	21.0	27.7	33.7	26.5	26.4	13.3
Asia-Pacific		8615											
	Japan												
	Fukuoka	2314	2.38	20.4	35.1	30.3	14.3	17.9	22.6	NA	15.4	14.2	NA
	Singapore												
	Singapore	2515	2.57	16.8	31.1	32.7	19.4	11.9	17.4	14.2	NA	13.2	10.7
	Indonesia												
	Bandung	1438	2.99	4.0	24.5	43.8	27.7	2.5	5.1	3.3	25.2	3.9	4.6
	Thailand												
	Chiang Mai	2348	1.90	30.5	47.5	19.4	2.6	7.7	7.0	27.2	20.5	8.1	16.5

Numbers in bold indicate the total number of participants per region of the world. NA: not available.

Table S2. Description and prevalence of the factors comprising the Healthy Lifestyle Index (HLI) in childhood, the ISAAC Phase Three.

Lifestyle factor	Index points	Description	Prevalence (%) in the study population		
			Boys (n=35122)	Girls (n=35673)	Overall (n=70795)
Parental smoking	0	Mother or father smoker	42.9	43.0	43.0
	1	Mother & father non-smokers	57.1	57.0	57.0
Overweight and obesity ¹	0	Overweight or obese	25.3	26.5	25.9
	1	Healthy weight	74.7	73.5	74.1
Child's Mediterranean diet ²	0	Unhealthy diet quality, score < median	59.4	58.4	58.9
	1	Healthy diet quality, score ≥ median	40.6	41.6	41.1
Child's physical activity	0	Never or occasionally	35.3	40.8	38.1
	1	At least once per week	64.7	59.2	61.9
Child's sedentary behaviour	0	1 or more TV viewing hours a day	84.5	82.5	83.5
	1	Less than 1 TV viewing hour a day	15.5	17.5	16.5

¹Based on the cut-off points of body mass index reported by Cole et al [14]. ²A score of the 'Mediterranean diet' pattern was developed according to the consumption frequency of eleven food items (fruit, fish, vegetables, pulses, cereals, pasta, rice, potatoes, meat, milk and fast food) based on the score used by Psaltopoulou et al.¹⁵

Table S3. Associations* (odds ratio and 95% CI) between healthy lifestyle index and symptoms of asthma, rhino-conjunctivitis, and eczema at 6–7 years of age stratified by child’s sex, ISAAC Phase Three.

	N	Healthy lifestyle index points			
		0-1	2	3	4-5
Males					
Current wheeze ¹	30181	1.0	0.91 (0.82, 1.01)	0.79 (0.71, 0.88)	0.65 (0.57, 0.74)
Asthma ever ²	27461	1.0	0.89 (0.79, 1.01)	0.82 (0.73, 0.93)	0.70 (0.60, 0.80)
Current symptoms of rhinoconjunctivitis ³	26038	1.0	0.94 (0.84, 1.06)	0.86 (0.77, 0.97)	0.80 (0.70, 0.92)
Hay fever ever ⁴	26532	1.0	0.98 (0.87, 1.11)	0.96 (0.84, 1.08)	0.84 (0.73, 0.97)
Current symptoms of eczema ⁴	26015	1.0	0.88 (0.77, 1.02)	0.91 (0.79, 1.05)	0.86 (0.73, 1.02)
Eczema ever ⁵	28709	1.0	1.00 (0.91, 1.11)	0.97 (0.88, 1.07)	1.12 (1.00, 1.26)
Females					
Current wheeze ¹	30941	1.0	0.96 (0.86, 1.08)	0.75 (0.67, 0.85)	0.67 (0.58, 0.77)
Asthma ever ²	28033	1.0	0.88 (0.77, 0.99)	0.74 (0.65, 0.85)	0.63 (0.54, 0.75)
Current symptoms of rhinoconjunctivitis ³	27328	1.0	1.03 (0.91, 1.17)	0.98 (0.87, 1.11)	0.94 (0.81, 1.09)
Hay fever ever ⁴	27215	1.0	1.09 (0.96, 1.24)	1.02 (0.89, 1.16)	1.01 (0.86, 1.18)
Current symptoms of eczema ⁴	26674	1.0	0.90 (0.79, 1.03)	0.82 (0.72, 0.94)	0.82 (0.71, 0.96)
Eczema ever ⁵	29455	1.0	0.97 (0.88, 1.07)	0.97 (0.88, 1.07)	0.99 (0.88, 1.10)

¹Multivariate analysis (children with complete covariate data), adjusted for gross national income, region of the world, breastfeeding, pets at home, and paracetamol use for fever.

²Multivariate analysis (children with complete covariate data), adjusted for gross national income, region of the world, maternal education, siblings, pets at home, and paracetamol use for fever.

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⁵Multivariate analysis (children with complete covariate data), adjusted for gross national income, region of the world, maternal education, breastfeeding, and paracetamol use for fever.

Table S4. Associations* (odds ratio and 95% CI) between healthy lifestyle index and symptoms of asthma, rhino-conjunctivitis, and eczema at 6–7 years of age stratified by region of the world, ISAAC Phase Three.

	N	Healthy lifestyle index points			
		0-1	2	3	4-5
Western Europe					
Current wheeze ¹	20225	1.0	0.86 (0.75, 0.98)	0.65 (0.57, 0.75)	0.53 (0.45, 0.63)
Asthma ever ²	19560	1.0	0.87 (0.76, 0.99)	0.76 (0.66, 0.87)	0.66 (0.56, 0.77)
Current symptoms of rhinoconjunctivitis ³	18014	1.0	1.04 (0.89, 1.22)	0.85 (0.73, 1.00)	0.82 (0.69, 0.98)
Hay fever ever ⁴	19457	1.0	1.13 (0.96, 1.33)	0.98 (0.83, 1.16)	0.88 (0.73, 1.06)
Current symptoms of eczema ⁴	19267	1.0	0.85 (0.72, 1.01)	0.76 (0.64, 0.90)	0.77 (0.64, 0.93)
Eczema ever ⁵	19696	1.0	1.03 (0.93, 1.14)	0.98 (0.88, 1.08)	1.04 (0.93, 1.17)
Northern and Eastern Europe					
Current wheeze ¹	8275	1.0	1.09 (0.89, 1.33)	0.89 (0.71, 1.10)	0.83 (0.64, 1.08)
Asthma ever ²	7188	1.0	1.12 (0.84, 1.50)	0.98 (0.71, 1.34)	0.87 (0.57, 1.34)
Current symptoms of rhinoconjunctivitis ³	6321	1.0	1.09 (0.83, 1.44)	1.26 (0.96, 1.67)	1.48 (1.07, 2.03)
Hay fever ever ⁴	7257	1.0	1.04 (0.81, 1.34)	1.15 (0.89, 1.49)	1.18 (0.88, 1.60)
Current symptoms of eczema ⁴	7107	1.0	0.91 (0.71, 1.16)	1.05 (0.81, 1.35)	1.05 (0.77, 1.42)
Eczema ever ⁵	8128	1.0	0.92 (0.77, 1.11)	1.07 (0.89, 1.29)	1.22 (0.98, 1.51)
Eastern Mediterranean					
Current wheeze ¹	7332	1.0	0.91 (0.72, 1.15)	0.73 (0.57, 0.94)	0.81 (0.57, 1.14)
Asthma ever ²	5933	1.0	0.70 (0.51, 0.96)	0.76 (0.55, 1.06)	0.82 (0.49, 1.35)
Current symptoms of rhinoconjunctivitis ³	6727	1.0	0.75 (0.55, 1.03)	0.74 (0.53, 1.03)	1.00 (0.66, 1.53)
Hay fever ever ⁴	5951	1.0	1.04 (0.76, 1.42)	1.04 (0.74, 1.47)	1.46 (0.91, 2.35)
Current symptoms of eczema ⁴	5839	1.0	0.58 (0.36, 0.93)	0.81 (0.50, 1.30)	1.03 (0.53, 2.01)
Eczema ever ⁵	6029	1.0	0.91 (0.70, 1.18)	0.89 (0.68, 1.18)	1.27 (0.85, 1.89)
Latin-America					
Current wheeze ¹	16283	1.0	0.94 (0.81, 1.10)	0.83 (0.71, 0.98)	0.60 (0.49, 0.74)
Asthma ever ²	15960	1.0	0.87 (0.72, 1.04)	0.76 (0.63, 0.92)	0.59 (0.46, 0.76)
Current symptoms of rhinoconjunctivitis ³	14614	1.0	0.93 (0.81, 1.06)	0.85 (0.74, 0.97)	0.69 (0.59, 0.82)
Hay fever ever ⁴	14086	1.0	0.98 (0.82, 1.17)	0.93 (0.78, 1.11)	0.81 (0.65, 1.00)
Current symptoms of eczema ⁴	14109	1.0	0.99 (0.83, 1.18)	0.89 (0.75, 1.06)	0.81 (0.66, 0.99)
Eczema ever ⁵	15515	1.0	0.96 (0.79, 1.16)	0.78 (0.64, 0.95)	0.89 (0.71, 1.12)
Asia-Pacific					
Current wheeze ¹	5679	1.0	0.98 (0.78, 1.24)	0.92 (0.71, 1.19)	0.85 (0.60, 1.19)
Asthma ever ²	3539	1.0	1.11 (0.78, 1.56)	1.01 (0.69, 1.48)	0.76 (0.46, 1.25)
Current symptoms of rhinoconjunctivitis ³	4735	1.0	1.12 (0.85, 1.49)	1.28 (0.95, 1.73)	0.95 (0.64, 1.42)
Hay fever ever ⁴	3721	1.0	0.97 (0.78, 1.21)	1.05 (0.82, 1.34)	1.08 (0.80, 1.47)
Current symptoms of eczema ⁴	3228	1.0	0.89 (0.68, 1.16)	0.86 (0.63, 1.18)	0.74 (0.44, 1.26)
Eczema ever ⁵	5503	1.0	0.95 (0.78, 1.15)	0.99 (0.80, 1.24)	1.02 (0.75, 1.37)
Oceania					
Current wheeze ¹	-	-	-	-	-
Asthma ever ²	3314	1.0	0.88 (0.66, 1.17)	0.80 (0.61, 1.06)	0.75 (0.55, 1.00)
Current symptoms of rhinoconjunctivitis ³	2955	1.0	1.02 (0.67, 1.56)	1.09 (0.73, 1.63)	1.24 (0.81, 1.88)
Hay fever ever ⁴	3275	1.0	0.97 (0.69, 1.36)	1.02 (0.74, 1.42)	1.06 (0.75, 1.50)
Current symptoms of eczema ⁴	3178	1.0	0.74 (0.52, 1.06)	0.81 (0.57, 1.13)	0.75 (0.52, 1.07)
Eczema ever ⁵	3293	1.0	0.90 (0.68, 1.20)	1.08 (0.82, 1.42)	1.11 (0.83, 1.49)

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²Multivariate analysis (children with complete covariate data), adjusted for child's sex, gross national income, maternal education, siblings, pets at home, and paracetamol use for fever.

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⁵Multivariate analysis (children with complete covariate data), adjusted for child's sex, gross national income, maternal education, breastfeeding, and paracetamol use for fever.

Table S5. Associations* (odds ratio and 95% CI) between healthy lifestyle index and symptoms of asthma, rhino-conjunctivitis, and eczema at 6–7 years of age stratified by gross national income per capita, the ISAAC Phase Three.

	N	Healthy lifestyle index points			
		0-1	2	3	4-5
Low-income					
Current wheeze ¹	1438	1.0	1.24 (0.15, 10.23)	1.62 (0.21, 12.5)	1.08 (0.13, 8.89)
Asthma ever ²	1219	1.0	1.42 (0.31, 6.49)	1.70 (0.39, 7.48)	0.78 (0.16, 3.71)
Current symptoms of rhinoconjunctivitis ³	1320	1.0	1.29 (0.16, 10.65)	2.55 (0.34, 19.36)	1.59 (0.20, 12.60)
Hay fever ever ⁴	-	-	-	-	-
Current symptoms of eczema ⁴	1188	1.0	1.06 (0.23, 4.89)	1.34 (0.31, 5.86)	0.90 (0.20, 4.11)
Eczema ever ⁵	1438	1.0	0.27 (0.08, 0.94)	0.41 (0.14, 1.26)	0.34 (0.11, 1.12)
Low-middle income					
Current wheeze ¹	11227	1.0	0.85 (0.72, 1.02)	0.73 (0.60, 0.89)	0.68 (0.52, 0.89)
Asthma ever ²	10260	1.0	0.83 (0.67, 1.04)	0.78 (0.62, 0.99)	0.68 (0.48, 0.95)
Current symptoms of rhinoconjunctivitis ³	9984	1.0	0.92 (0.74, 1.14)	0.97 (0.78, 1.22)	0.95 (0.71, 1.27)
Hay fever ever ⁴	10402	1.0	0.98 (0.82, 1.16)	0.99 (0.82, 1.19)	1.00 (0.78, 1.29)
Current symptoms of eczema ⁴	10120	1.0	0.85 (0.69, 1.04)	0.81 (0.65, 1.01)	0.91 (0.68, 1.20)
Eczema ever ⁵	10691	1.0	0.89 (0.76, 1.04)	0.84 (0.71, 1.00)	0.94 (0.74, 1.21)
Upper-middle income					
Current wheeze ¹	22827	1.0	1.04 (0.91, 1.18)	0.87 (0.76, 0.99)	0.70 (0.59, 0.84)
Asthma ever ²	20833	1.0	0.93 (0.79, 1.09)	0.88 (0.67, 0.95)	0.66 (0.52, 0.83)
Current symptoms of rhinoconjunctivitis ³	19468	1.0	0.96 (0.85, 1.09)	0.89 (0.79, 1.01)	0.80 (0.68, 0.94)
Hay fever ever ⁴	19041	1.0	1.00 (0.86, 1.18)	0.99 (0.85, 1.17)	0.87 (0.72, 1.06)
Current symptoms of eczema ⁴	18936	1.0	0.97 (0.83, 1.13)	0.96 (0.82, 1.12)	0.85 (0.70, 1.03)
Eczema ever ⁵	21188	1.0	0.96 (0.84, 1.11)	0.95 (0.82, 1.09)	1.11 (0.94, 1.31)
High income					
Current wheeze ¹	25630	1.0	0.89 (0.79, 0.99)	0.71 (0.63, 0.79)	0.61 (0.54, 0.70)
Asthma ever ²	23236	1.0	0.88 (0.78, 0.99)	0.78 (0.69, 0.88)	0.68 (0.60, 0.78)
Current symptoms of rhinoconjunctivitis ³	22594	1.0	1.04 (0.90, 1.19)	0.92 (0.80, 1.05)	0.89 (0.77, 1.04)
Hay fever ever ⁴	23085	1.0	1.09 (0.95, 1.26)	0.99 (0.86, 1.15)	0.93 (0.79, 1.09)
Current symptoms of eczema ⁴	22445	1.0	0.83 (0.72, 0.97)	0.78 (0.67, 0.91)	0.77 (0.66, 0.91)
Eczema ever ⁵	24847	1.0	1.03 (0.94, 1.13)	1.01 (0.92, 1.11)	1.07 (0.97, 1.18)

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