Supplemental material to the manuscript are intended for publication as an online data supplement

S. Lachman et al. Ideal cardiovascular health and risk of cardiovascular events in the EPIC-Norfolk prospective population study.

Food frequency questionnaire

Dietary information was obtained from a 130 item food frequency questionnaire (FFQ), consisting of 11 fruit and 22 vegetable items (excl. fruit juices, potatoes, garlic, cooked vegetables were assumed to be cooked in salted water), 1 nuts and 3 legumes items (incl. peanuts/nuts, soya products, baked beans, dread beans), 6 wholegrain items (incl. whole meal bread, crisp bread, breakfast cereals, pasta, brown rice, porridge), 6 processed meat items (incl. bacon, ham, corned beef/spam, sausages, and the disaggregated processed meat components of savory pies and offal products), 6 fish items (inc. oily fish), and 9 sugar-sweetened beverage items (incl. juice, soft/fizzy drinks, squash, hot chocolate/Horlicks, sugar in tea/coffee).

The FFQ had the same frequency categories for every FFQ item, which were converted to a daily portion multiplier: never/< 1 per month (0), 1-3 times per month (0.07), 1 items per week (0.14), 2-4 times/week (0.43), 5-6 times/week (0.79), daily (1), 2-3 times per day (2.5), 4-5 times per day (4.5), up to 6 portions per day (6). Depending on the FFQ items, the portion size consisted of the weight of a unit or a minimal serving size. The frequency was multiplied by portion size to obtain the weight of the FFQ items consumed. Further elaborated information on FFQ is provided here:

http://www.srl.cam.ac.uk/epic/epicffq/index.html.

Supplementary tables – Sensitivity analysis, n = 21,856

Table 1. Baseline characteristics in EPIC-Norfolk participants

Age, years	59.0 ± 9.2
Male	44.5 (9,736)
Body mass index, kg/m2	26.2 ± 3.8
Systolic blood pressure, mmHg	135 ± 18
Diastolic blood pressure, mmHg	82 ± 11
Total cholesterol, mmol/l	6.2 ± 1.2
LDL cholesterol, mmol/l	4.0 ± 1.0
HDL cholesterol, mmol/l	1.4 ± 0.4
Triglycerides, mmol/l	1.8 (1.1 - 2.2)
Healthy diet	
- Fruit and vegetables ≥ 4.5 cups per day	67.5 (7,111)
- Fish ≥ 2 servings per week	52.2 (10,437)
- Fiber-rich whole grains ≥ 3 servings per day	44.6 (9,737)
- Sodium < 1500 mg per day	3.8 (828)
- Sugar-sweetened beverages ≤ 450 kcal per week	42.0 (9,405)
Physical activity	
- Inactive	29.1 (6,368)
- Moderately inactive	29.0 (6,310)
- Moderately active	23.2 (5,077)
- Active	18.8 (4,101)
Smoking behaviour	
- Current	11.5 (2,513)
- Former	41.5 (9,079)
- Never	47.0 (10,264)

Data are presented as percentage (number) for categorical variables, mean ± standard deviation continuous variables.
Data were available in up to 21,856 study participants.
LDL indicates low-density lipoprotein; HDL indicates high-density lipoprotein.

Table 2. Distribution of cardiovascular health metrics in EPIC-Norfolk participants

Cardiovascular health metric		Definition	Percentage (number)
Body mass index			
	- Ideal	< 25 kg/m^2	40.4 (8,827)
	- Intermediate	25 to 30 kg/m^2	45.2 (9,882)
	- Poor	≥ 30 kg/m^2	14.4 (3,147)
Healhy diet score			
	- Ideal	≥ 4 healthy components	9.3 (2,027)
	- Intermediate	2 - 4 healthy components	60.0 (13,073)
	- Poor	< 2 healthy components	30.9 (6,756)
Physical activity			
	- Ideal	Active	18.8 (4,101)
	- Intermediate	Moderately active or moderately inactive	52.1 (11,387)
	- Poor	Inactive	29.1 (6,368)
Smoking behaviour			
	- Ideal	Never	47.0 (10,264)
	- Intermediate	Former	41.5 (9,079)
	- Poor	Current	11.5 (2,513)
Blood pressure			
	- Ideal	SBP < 120 and DBP < 80 mmHg, without drug therapy	17.7 (3,860)
	- Intermediate	SBP ≥ 120 to < 140 or DBP ≥ 80 to < 90 or treated to SBP < 140 and or DBP < 90 mmHg	42.3 (9,240)
	- Poor	SBP ≥ 140 or DBP ≥ 90 mm Hg	40.1 (8,756)
Total cholesterol			
	- Ideal	< 5.2 mmol/l	18.5 (4,040)
	- Intermediate	5.2 - 6.2 mmol/l	37.6 (8,207)
	- Poor	≥ 6.2 mmol/l	44.0 (9,609)
Total			21,856

Data are presented as percentage (number)

Table 3. Risk of cardiovascular disease by health metrics

Cardiovascular Health metrics		Poor	Intermediate	Ideal	Total
Body mass index					
Number		3,147	9,882	8,827	21,856
Events		522	1,440	897	2,859
Event rate		16.6	14.6	10.2	
Model 1	Hazard ratio	1.00 (ref)	0.78	0.53	
	95% confidence interval		(0.73-0.84)	(0.49-0.57)	
	p-value		< 0.001	< 0.001	
Model 2	Hazard ratio	1.00 (ref)	0.75	0.59	
	95% confidence interval		(0.70-0.80)	(0.55-0.64)	
	p-value		< 0.001	< 0.001	
Healthy diet score					
Number		6,756	13,073	2,027	21,856
Events		961	1,663	235	2,859
Event rate		14.2	12.7	11.6	
Model 1	Hazard ratio	1.00 (ref)	0.95	0.88	
	95% confidence interval		(0.90-1.01)	(0.80-0.98)	
	p-value		0.09	0.01	
Model 2	Hazard ratio	1.00 (ref)	0.93	0.86	
	95% confidence interval		(0.88-0.98)	(0.78-0.95)	
	p-value		0.01	0.004	
Physical activity					
Number		6,368	11,387	4,101	21,856
Events		1,161	1,285	413	2,859
Event rate		18.2	11.3	10.1	
Model 1	Hazard ratio	1.00 (ref)	0.68	0.56	
	95% confidence interval		(0.64-0.72)	(0.52-0.61)	
	p-value		<0.001	<0.001	
Model 2	Hazard ratio	1.00 (ref)	0.91	0.83	
	95% confidence interval		(0.85-0.96)	(0.76-0.90)	
	p-value		0.001	< 0.001	
Smoking behaviour					
Number		2,513	9,079	10,264	21,856
Events		414	1,430	1,015	2,859
Event rate		16.5	15.8	9.9	
Model 1	Hazard ratio	1.00 (ref)	1.07	0.79	
	95% confidence interval		(0.98-1.16)	(0.72-0.85)	
	p-value		0.13	< 0.001	
Model 2	Hazard ratio	1.00 (ref)	0.80	0.72	
	95% confidence interval		(0.74-0.87)	(0.66-0.79)	
	p-value		<0.001	<0.001	
Blood pressure					
Number		8,756	9,240	3,860	21,856
Events		1,682	1,001	176	2,859
Event rate		19.2	10.8	4.6	
Model 1	Hazard ratio	1.00 (ref)	0.48	0.20	
	95% confidence interval		(0.45-0.51)	(0.18-0.22)	
	p-value		<0.001	<0.001	

Model 2	Hazard ratio	1.00 (ref)	0.62	0.32	
	95% confidence interval		(0.59-0.66)	(0.29-0.36)	
	p-value		<0.001	<0.001	
Total cholesterol					
Number		9,609	8,207	4,040	21,856
Events		1,538	969	352	2,859
Event rate		16.0	11.8	8.7	
Model 1	Hazard ratio	1.00 (ref)	0.76	0.65	
	95% confidence interval		(0.72-0.81)	(0.60-0.70)	
	p-value		<0.001	<0.001	
Model 2	Hazard ratio	1.00 (ref)	0.88	0.86	
	95% confidence interval		(0.83-0.93)	(0.79-0.93)	
	p-value		< 0.001	< 0.001	

Table 4. Risk of cardiovascular outcomes by cardiovascular health metrics among EPIC-Norfolk participants

Overall cardiovascular health score category		1 (Unhealthy)	2	3	4	5 (Healthy)	Total
Overall cardiovascular health score range		0-2	3-4	5-7	8-9	10-12	
Number (percentage)		841 (3.8)	4,845 (22.2)	11,751 (53.8)	3,752 (17.2)	667 (3.1)	21,856 (100.0)
Coronary heart disease							
Events		205	830	1,311	156	4	
Event rate		24.4	17.1	11.2	4.2	0.6	
Model 1	Hazard ratio	1.00 (ref)	0.66	0.40	0.14	0.02	
	95% confidence interval		(0.57 - 0.77)	(0.35-0.47)	(0.12-0.17)	(0.007 -0.05)	
	p-value		< 0.001	< 0.001	< 0.001	< 0.001	
Model 2	Hazard ratio	1.00 (ref)	0.69	0.52	0.27	0.05	
	95% confidence interval		(0.59 - 0.80)	(0.45-0.60)	(0.22-0.33)	(0.02 -0.15)	
	p-value		< 0.001	< 0.001	< 0.001	< 0.001	
Cerebrovascular disease							
Events		41	164	267	26	5	
Event rate		4.9	3.4	2.3	0.7	0.7	
Model 1	Hazard ratio	1.00 (ref)	0.66	0.42	0.12	0.13	
	95% confidence interval		(0.47 - 0.93)	(0.30 - 0.58)	(0.08 - 0.20)	(0.05 - 0.33)	
	p-value		0.02	< 0.001	< 0.001	< 0.001	
Model 2	Hazard ratio	1.00 (ref)	0.69	0.56	0.27	0.45	
	95% confidence interval		(0.49 - 0.97)	(0.40 - 0.78)	(0.16 - 0.44)	(0.17- 1.14)	
	p-value		0.03	0.001	< 0.001	0.09	
Cardiovascular disease							
Events		236	941	1,495	178	9	
Event rate		28.1	19.4	12.7	4.7	1.3	
Model 1	Hazard ratio	1.00 (ref)	0.64	0.39	0.14	0.04	
	95% confidence interval		(0.56 -0.74)	(0.34 - 0.45)	(0.11 - 0.17)	(0.02 - 0.07)	
	p-value		< 0.001	<0.001	<0.001	<0.001	
Model 2	Hazard ratio	1.00 (ref)	0.67	0.50	0.26	0.11	
	95% confidence interval		(0.58 -0.77)	(0.44 - 0.58)	(0.22 - 0.32)	(0.05 - 0.21)	
	p-value		< 0.001	<0.001	<0.001	<0.001	

Physical activity Questionnaire in EPIC, table and questionnaire were adapted from Wareham et al.[11]

Interpretation of the physical activity index groups.
EPIC physical activity questions

Label	Description
Very inactive	Sedentary job and no recreational activity
Moderately inactive	Sedentary job with <0.5 h recreational activity per day or standing job with no recreational activity per day
Moderately active	Sedentary job with 0.5–1.0 h recreational activity per day or standing job with 0.5 h recreational activity per day or physical job with no recreational activity per day
Very active	Sedentary job with >1.0 h recreational activity per day or standing job with >0.5 h recreational activity per day or physical job with at least some recreational activity or heavy manual job

1. We would like to know the type and amount of physical activity involved in your work. Please tick what best corresponds to your present activities from the following four possibilities:

Sedentary occupation _____
You spend most of your time sitting (such as in an office)
or Standing occupation _____
You spend most of your time standing or walking. However, your work does not require intense physical effort (e.g. shop assistant, hairdresser, guard, etc.)
or Physical work _____
This involves some physical effort including handling of heavy objects and use of tools (e.g. plumber, cleaner, nurse, sports instructor, electrician, carpenter, etc.)
or Heavy manual work _____
This involves very vigorous physical activity including handling of very heavy objects (e.g. docker, miner, bricklayer, construction worker, etc.)

2. In a typical week during the past 12 months, how many hours did you spend on each of the following activities? (Put '0' if none)

Walking, including walking to work, shopping and leisure
in summer _____ hours per week
in winter _____ hours per week
Cycling, including cycling to work and during leisure time
in summer _____ hours per week
in winter _____ hours per week
Gardening

in summer _____ hours per week
in winter _____ hours per week
Housework such as cleaning, washing, cooking, childcare
_____ hours per week
Do–it–yourself
_____ hours per week
Other physical exercise such as keep fit, aerobics, swimming, jogging
in summer _____ hours per week
in winter _____ hours per week

3. In a typical week during the past year did you practise any of these activities vigorously enough to cause sweating or a faster heartbeat?

Yes _____ No _____ Don't know_____
If yes, for how many hours per week in total did you practise such vigorous physical activity? (Put '0' if none)
_____hours per week

4. In a typical day during the past 12 months, how many floors of stairs did you climb up? (Put '0' if none)

_____floors per day