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Supplementary Materials for

Rapidly declining body temperature in a tropical human population

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This PDF file includes:

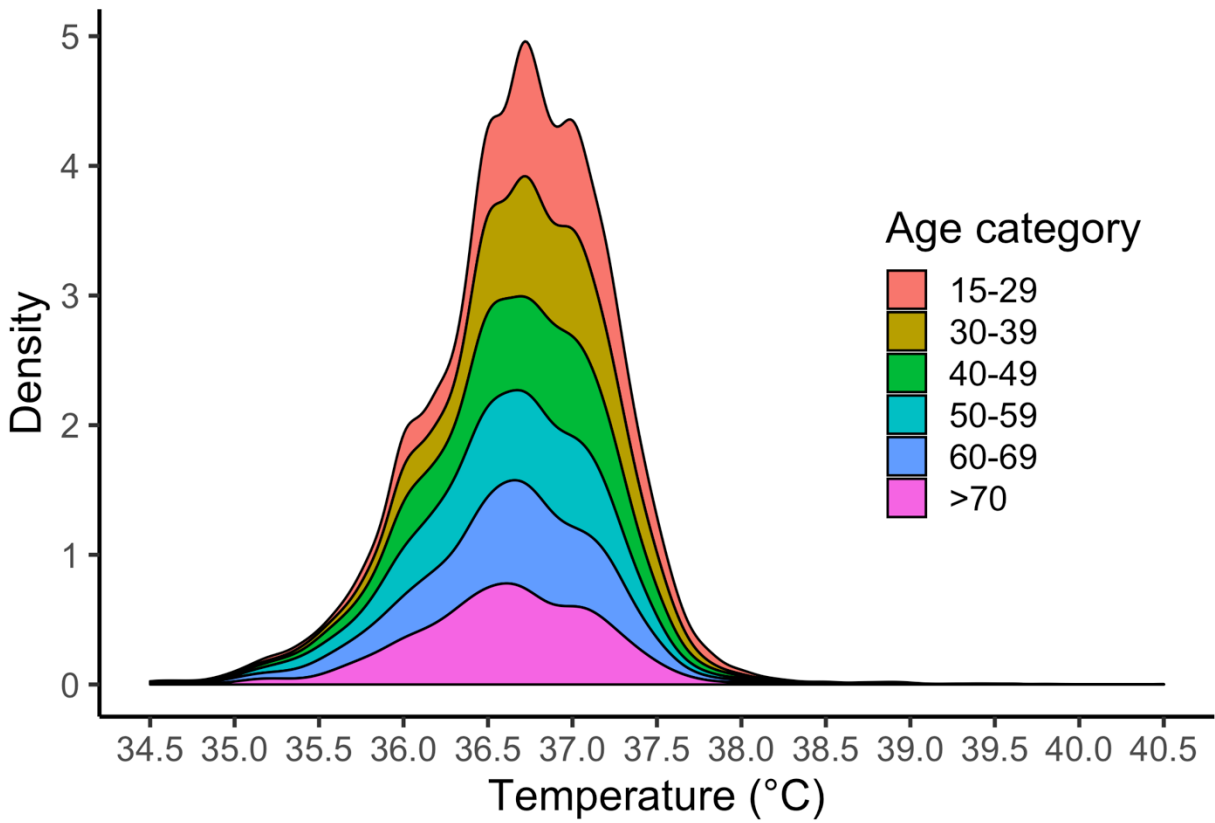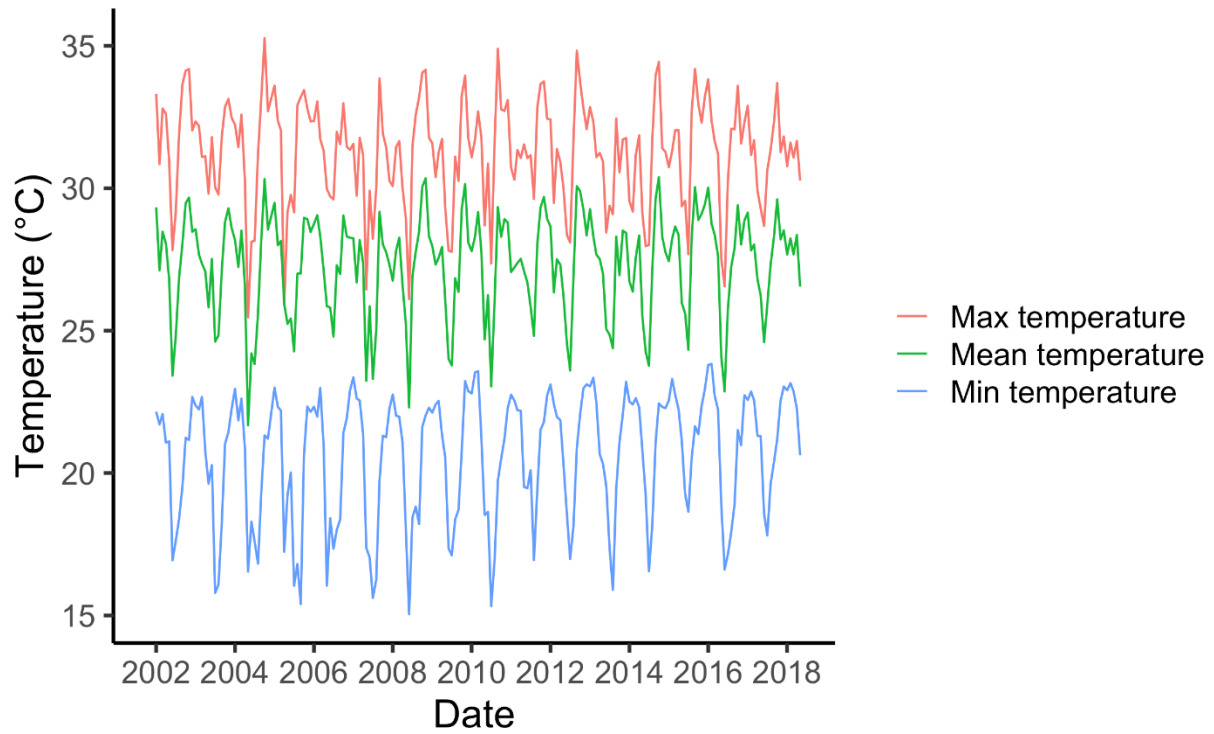Figs. S1 to S6
Tables S1 to S12

Figure S1. Stacked density plot of body temperatures by age category for all study observations of Tsimane age 15+ years (N=17,958). Mean temperatures are: Ages 15-29: 36.81°C; 30-39: 36.77°C; 40-49: 36.70°C; 50-59: 36.61°C; 60-69: 36.62°C; 70+: 36.61°C. Overall, 27.4% of all body temperature measurements are >37.0°C.

Figure S2. Ambient daily temperature (maximum, average, minimum) in San Borja, Beni, Bolivia. San Borja is the market town closest to Tsimane territory. Daily weather data downloaded from meteostat.net. Data are averaged by month.
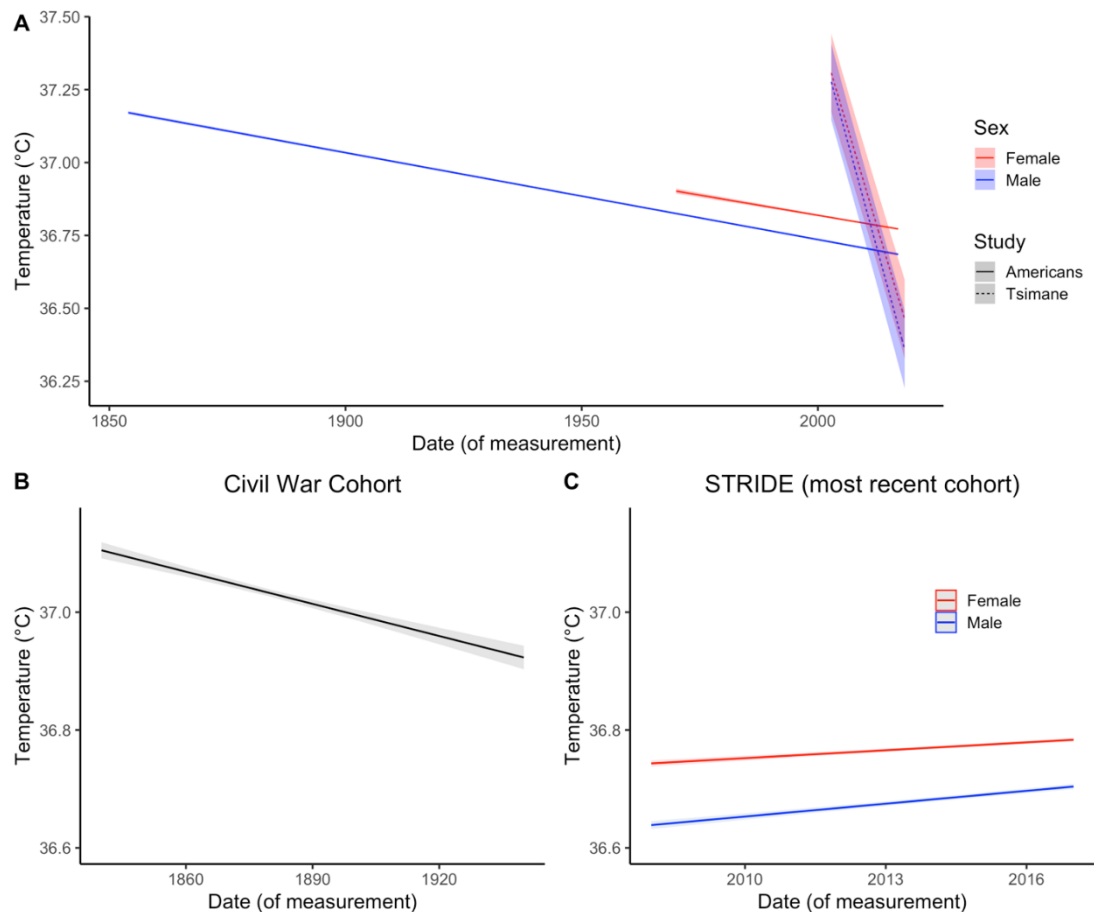
Figure S3. Temporal trends in Tsimane and U.S. body temperature. All lines show mean predicted values and 95% CIs. Panel **A** compares Tsimane body temperature with U.S. data from Protsiv et al. study (*11*) combining three cohorts [UAVCW Civil War (1860-1940), NHANES (1971-1975) and STRIDES (2007-2017)]. U.S. data were downloaded from https://cdn.elifesciences.org/articles/49555/elife-49555-data1-v2.zip, and reanalyzed as a function of measurement date (rather than birth year). Note that birth year and measurement date are interchangeable in terms of the model coefficient produced in models that also include age. The model of U.S. data shown here is the same as that displayed in Figure 3A in (*11*), but run as a single linear model with all variables interacting with sex rather than utilizing separate models for each sex. The model is therefore for "white" individuals only, although slopes are equivalent using "black" individuals only, or including a categorical variable for self-identified ethnicity and running a single model on all individuals. Consistent with (*11*), we show predicted values for a 30-year old who is 170 cm tall and weighs 70 kg. Panels **B** and **C** show within-cohort temporal body temperature trends for UAVCW and STRIDES cohorts, respectively. While cross-cohort analysis shows linear decline in U.S. body temperature (Panel A), within-cohort decline is evident only in the UAVCW cohort (**B**). Body temperature does not decline over time among the STRIDE cohort (**C**). Predicted values derive from separate models of temperature for each of the two cohorts as a function of ethnicity (categorical), age, sex, date of measurement, weight, and height, with interactions between all variables and sex except for ethnicity. Note that unlike (*11*), we opted not to exclude the ethnicity category "other" because we observed only minor differences in body temperature based on ethnicity, and a large sample size (n=181,954) were categorized as "other."
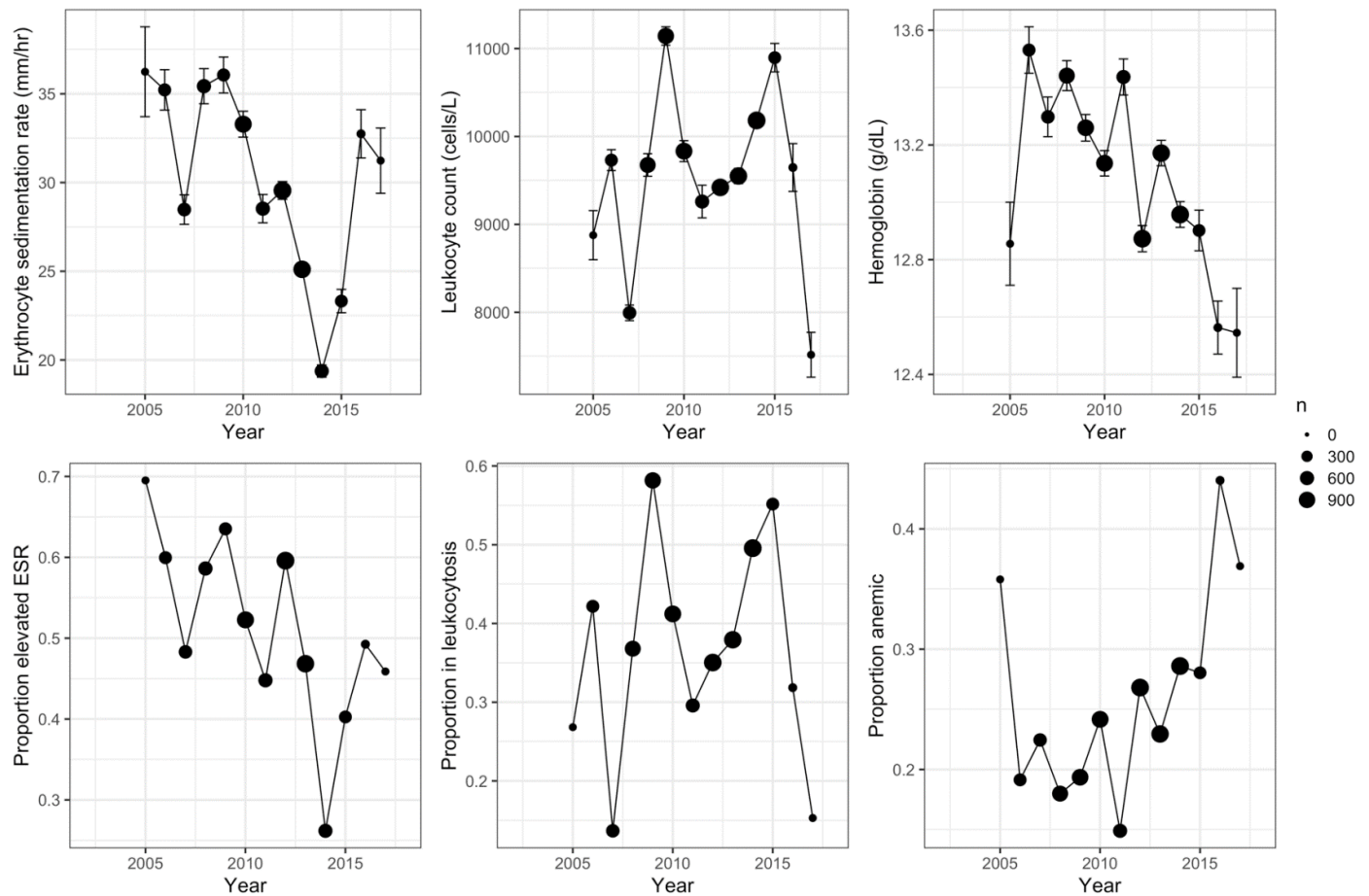
Figure S4. Descriptive time series of biomarkers of inflammation, immune activation and hemoglobin status in adults (>15 yrs). ESR = erythrocyte sedimentation rate (mm/hr), leukocyte count (cells/L), hemoglobin (Hb) (g/dL). Upper row shows mean and SE of biomarkers by year. Bottom row shows proportion falling beyond standard clinical cutoffs; anemia refers to hemoglobin<12 g/dL for women and <13 g/dL for men; elevated ESR is >20 mm/hr for ages<45 years and >30 mm/hr for ages 45+; leukocytosis is >10,000 /mm^3. ESR appears to decline over the study period, as does mean Hb, whereas WBC countfluctuates over time.
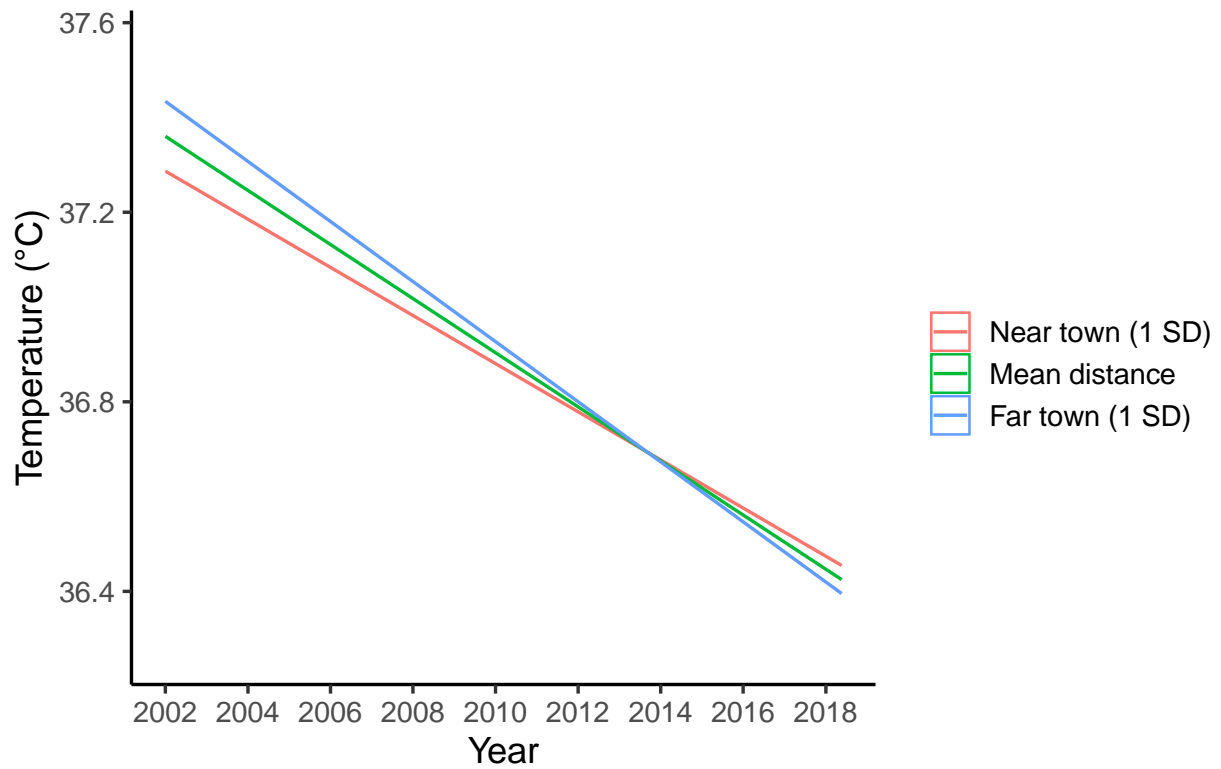
Figure S5. Predicted body temperature for Tsimane villages located "near" vs. "far" to the nearest market town of San Borja. Near refers to 1 SD below the mean distance to San Borja (14.2 km), "far" refers to 1 SD above the mean distance (104.2 km). All covariates are the same as in Table 1 [Model 3], and are set to population mean.
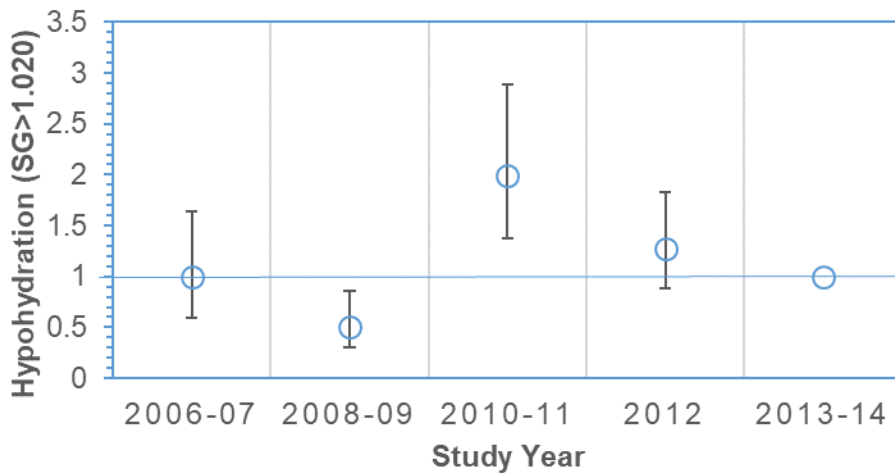
Figure S6. Dehydration, over period 2006-2014. Hypohydration defined as urine specific gravity > 1.020. All urine measurements (n=2,193) are from morning samples collected on a sub-sample of adults age 20+ during medical rounds. Odds ratio (OR) and 95% Wald confidence limits shown, with reference case 2013-2014. Logistic regression model adjusts for age, sex and season. Sample composition by time period: 12% (2006-07), 20% (2008-09), 25% (2010-11), 35% (2012), 7% (2013-14).

Table S1. Descriptive information on study variables. All observations across 2002-2018 for individuals age 15+ years: N=9,133 female; 7,697 male. Grey-shaded ICD-10 categories of medical diagnoses reflect those with average prevalence above 3%. Those eight categories are included in regression models in Tables 1, S3, S5, S6, S10, S11.

	Female		Male	
	Mean	STD	Mean	STD
Body temperature (°C)	36.79	0.50	36.70	0.51
Age (years)	34.98	15.89	36.96	15.99
Height (cm)	150.81	4.68	162.31	5.29
Weight (kg)	54.42	8.68	61.63	7.84
Daily Avg Ambient Temp (°C)	27.35	3.36	27.32	3.34
Distance to town (km)	58.46	44.89	60.22	45.58
# 1 = Infectious and parasitic diseases	0.20	0.40	0.20	0.40
# 2 = Neoplasms	0.01	0.10	0.01	0.09
# 3 = "Endocrine; nutritional; and metabolic diseases and immunity disorders"	0.01	0.09	0.00	0.06
# 4 = Diseases of the blood and blood-forming organs	0.08	0.27	0.03	0.18
# 5 = "Mental Illness"	0.00	0.04	0.00	0.04
# 6 = Diseases of the nervous system and sense organs	0.13	0.34	0.15	0.36
# 7 = "Diseases of the circulatory system"	0.03	0.16	0.03	0.17
# 8 = Diseases of the respiratory system	0.20	0.40	0.18	0.39
# 9 = Diseases of the digestive system	0.38	0.48	0.36	0.48
# 10 = Diseases of the genitourinary system	0.25	0.44	0.08	0.27
# 11 = "Complications of pregnancy; childbirth; and the puerperium"	0.10	0.30	0.00	0.02
# 12 = Diseases of the skin and subcutaneous tissue	0.03	0.16	0.04	0.19
# 13 = "Diseases of the musculoskeletal system and connective tissue"	0.39	0.49	0.56	0.50
# 14 = Congenital anomalies	0.00	0.04	0.00	0.06
# 15 = Certain conditions originating in the perinatal period	0.00	0.03	0.00	0.03
# 16 = Injury and poisoning	0.01	0.10	0.03	0.16
# 17 "Symptoms; signs; and ill-defined conditions and factors influencing health status"	0.02	0.15	0.01	0.11
# 18 = "Residual codes; unclassified; all E codes [259. and 260.]"	0.00	0.05	0.00	0.03
# Co-morbidities across categories	1.85	1.09	1.68	1.06
Healthy (No diagnoses)	0.06	0.24	0.08	0.28

Table S2. Sample characteristics by study year.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
									Year								
Body temperature (°C)	37.9	37.4	36.7	37	37	36.9	37	37	36.8	36.8	36.5	36.4	36.5	36.7	36.6	36.4	36.6
Age (years)	26.7	29.3	34.7	34.2	34.4	34.5	34.2	34.3	33.2	33.8	36.6	35.4	37.5	44.3	45.9	43.9	38.6
% Male	0.5	0.3	0.42	0.46	0.47	0.47	0.46	0.46	0.47	0.46	0.44	0.45	0.47	0.46	0.38	0.46	0.43
Height (cm)	150	152	154	156	156	156	156	156	156	156	156	156	156	156	155	155	155
Weight (kg)	43.8	51.4	52	57.1	57.6	57.4	57.5	57.9	57.5	57.7	58.2	58.5	56.4	58.1	58.3	57.3	59.2
Daily Avg Ambient Temp (°C)	25.8	26.7	24	27.3	27.3	27.4	27.3	26.2	27.9	28.1	26.5	27.4	27.2	26.7	28.7	26.3	28.1
Distance to town (km)	97.3	97.8	85	50.3	58.8	50.8	55.8	62.6	64.7	67.3	54.8	41.7	49.7	76.6	25.6	77.1	77.7
N	4	30	45	312	1282	1286	1416	1070	2704	1876	1812	1294	1236	844	349	560	710

Table S3. Annual measures of age-standardized prevalence of illnesses based on ICD-10 codes classified according to Clinical Classifications Software categories. Note that these data derive from a data set from medical visits that extends beyond cases for which temperature data were available (N = 20,730 observations). For age-standardization we used the 2010 THLHP census as a reference population.

	Year																
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
# 1 = Infectious and parasitic diseases	0.03	0.11	0.17	0.25	0.09	0.14	0.21	0.39	0.15	0.18	0.25	0.45	0.14	0.2	0.13	0.21	0.25
# 2 = Neoplasms	0	0.01	0.01	0	0	0.02	0.02	0.02	0.02	0	0.01	0.01	0	0.01	0.01	0.01	0
# 3 = "Endocrine; nutritional; metabolic diseases, immunity disorders"	0	0	0	0	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0	0	0	0.01	0	0
# 4 = Diseases of the blood and blood-forming organs	0.15	0.02	0.16	0.05	0.02	0.03	0.08	0.1	0.03	0.03	0.03	0.04	0.1	0.17	0.05	0.09	0.1
# 5 = "Mental Illness"	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0.01	0	0
# 6 = Diseases of the nervous system and sense organs	0.08	0.02	0.02	0.03	0.08	0.15	0.09	0.27	0.12	0.16	0.24	0.25	0.12	0.05	0.17	0.26	0.19
# 7 = "Diseases of the circulatory system"	0.01	0.07	0.07	0.05	0.02	0.01	0.03	0.05	0.05	0.04	0.02	0.01	0.01	0.01	0.07	0.08	0.06
# 8 = Diseases of the respiratory system	0.32	0.27	0.31	0.29	0.25	0.22	0.16	0.28	0.18	0.25	0.13	0.17	0.14	0.11	0.17	0.19	0.13
# 9 = Diseases of the digestive system	0.29	0.28	0.37	0.47	0.49	0.55	0.37	0.5	0.48	0.41	0.23	0.25	0.2	0.27	0.36	0.41	0.44
# 10 = Diseases of the genitourinary system	0.23	0.15	0.28	0.38	0.26	0.26	0.13	0.2	0.22	0.18	0.11	0.12	0.07	0.11	0.3	0.24	0.19
# 11 = "Complications of pregnancy; childbirth; and the puerperium"	0	0	0	0	0.01	0.06	0.06	0.06	0.07	0.05	0.05	0.07	0.05	0.01	0.01	0.01	0
# 12 = Diseases of the skin and subcutaneous tissue	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.04	0.03	0.02	0.03	0.08	0.02	0.02	0.04	0.05	0.06
# 13 = "Diseases of the musculoskeletal system and connective tissue"	0.51	0.47	0.44	0.42	0.69	0.69	0.5	0.58	0.44	0.6	0.28	0.34	0.48	0.44	0.4	0.6	0.57
# 14 = Congenital anomalies	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0
# 15 = Certain conditions originating in the perinatal period	0	0	0	0	0	0	0	0	0	0	0.01	0.01	0	0	0	0	0
# 16 = Injury and poisoning	0.01	0.01	0	0	0	0.02	0.03	0.04	0.01	0.01	0.02	0.05	0.01	0.01	0.02	0.01	0.01
# 17 "Symptoms; signs; and ill-defined conditions and factors influencing health	0.01	0	0	0	0	0.02	0.01	0	0.01	0.01	0.05	0.03	0.01	0.01	0.03	0.05	0.05
# 18 = "Residual codes; unclassified; all E codes [259. and 260.]"	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0
Healthy (No diagnoses)	0.03	0.13	0.08	0.06	0.03	0.02	0.07	0.03	0.06	0.03	0.12	0.12	0.11	0.17	0	0	0
# Co-morbidities across categories	1.66	1.43	1.85	1.96	1.92	2.2	1.76	2.56	1.82	1.96	1.48	1.89	1.35	1.42	1.77	2.21	2.05
N	189	1179	1323	658	1359	1312	1456	1084	2884	2010	1867	1374	1323	890	391	662	769

Table S4: Number of observations by age and sex for each study period.

Study period	Age	n_{female}	n_{male}
2002-2006	15-29	340	231
	30-39	143	147
	40-49	102	90
	50-59	62	56
	60-69	31	34
	>70	18	15
2007-2012	15-29	2644	1995
	30-39	1249	1106
	40-49	825	877
	50-59	445	433
	60-69	307	343
	>70	141	131
2013-2018	15-29	1307	870
	30-39	623	504
	40-49	576	520
	50-59	406	475
	60-69	307	290
	>70	164	150

Table S5. Additional models building upon Model 3 of Table 1 (from main paper). Model 4 includes a quadratic date term to permit non-linear CBT decline over time. Model 5 considers only those Tsimane who received a diagnosis of "healthy". Model 6 considers biomarkers of health status (erythrocyte sedimentation rate, ESR), hemoglobin (Hb) and leukocyte count, WBC). All models include random effects for individual ID, community ID, and physician ID (except for the model of "healthy" only, which includes few repeated measures of individuals and therefore omits the random effect of individual ID).

	Dependent variable: Body Temperature				
	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
	Quadratic	Healthy	+ Biomarkers	Ages 20+	Ages 40+
Height (cm)	-0.001	0.002	-0.001	-0.002*	-0.004**
	(-0.003, 0.0001)	(-0.003, 0.007)	(-0.004, 0.001)	(-0.004, -0.0004)	(-0.007, -0.001)
Weight (kg)	0.001**	0.001	0.001	0.001**	0.002*
	(0.0005, 0.002)	(-0.002, 0.005)	(-0.0004, 0.002)	(0.0004, 0.002)	(0.0004, 0.003)
Age (years)	-0.003***	-0.002	-0.003***	-0.003***	-0.002**
	(-0.003, -0.002)	(-0.005, 0.001)	(-0.004, -0.002)	(-0.004, -0.002)	(-0.004, -0.001)
Sex (ref =Female)	-1.842*	0.283	0.024	0.204*	0.184
	(-3.634, -0.050)	(-0.515, 1.080)	(-0.285, 0.334)	(0.025, 0.384)	(-0.104, 0.472)
Male:Age	-0.001	-0.002	0.0001	-0.001	0.001
	(-0.001, 0.0003)	(-0.006, 0.002)	(-0.001, 0.001)	(-0.002, .0004)	(-0.002, 0.003)
Date (years)	-0.119	-0.046***	-0.057***	-0.054***	-0.059***
	(-0.243, 0.006)	(-0.066, -0.026)	(-0.066, -0.047)	(-0.060, -0.048)	(-0.068, -0.051)
Date*Date	0.001				
	(-0.001, 0.002)				
Male:Date	0.091*	-0.008	-0.002	-0.006**	-0.007*
	(0.005, 0.177)	(-0.028, 0.011)	(-0.010, 0.005)	(-0.010, -0.002)	(-0.013, -0.0003)
Male:Date*Date	-0.001*				
	(-0.002, -0.0001)				
Method (ref = "ear")	-0.049*		-0.056	-0.049*	-0.118***
	(-0.092, -0.006)		(-0.120, 0.008)	(-0.092, -0.006)	(-0.186, -0.050)
Season (ref = "dry")	0.040***	0.091**	0.068***	0.036***	0.033*
	(0.023, 0.057)	(0.036, 0.147)	(0.041, 0.095)	(0.017, 0.054)	(0.004, 0.061)
Avg ambient temp (°C)	0.029***	0.029***	0.026***	0.030***	0.032***
	(0.027, 0.031)	(0.021, 0.036)	(0.023, 0.030)	(0.027, 0.032)	(0.028, 0.036)
Infectious Diseases (Yes/No)	-0.017		-0.006	-0.020*	-0.012
	(-0.034, 0.001)		(-0.030, 0.018)	(-0.038, -0.002)	(-0.037, 0.013)
Blood Diseases (Yes/No)	-0.003		0.015	-0.01	0.026
	(-0.031, 0.025)		(-0.030, 0.060)	(-0.041, 0.021)	(-0.019, 0.070)
Nervous System/Sensory (Yes/No)	-0.017		0.011	-0.01	-0.005
	(-0.036, 0.002)		(-0.016, 0.039)	(-0.030, 0.011)	(-0.033, 0.023)
Respiratory System (Yes/No)	0.075***		0.061***	0.060***	0.048**
	(0.059, 0.092)		(0.035, 0.088)	(0.041, 0.079)	(0.018, 0.078)

	(1)	(2)	(3)	(4)	(5)
Digestive System	-0.007		-0.006	-0.007	-0.025[*]
(Yes/No)	(-0.021, 0.007)		(-0.028, 0.017)	(-0.022, 0.009)	(-0.049, -0.002)
Genitourinary System	0.025[**]		0.025	0.027[**]	0.031[*]
(Yes/No)	(0.007, 0.043)		(-0.003, 0.052)	(0.008, 0.047)	(0.0003, 0.061)
Skin/Subcutaneous	0.038[*]		0.039	0.013	-0.026
(Yes/No)	(0.001, 0.075)		(-0.020, 0.098)	(-0.028, 0.055)	(-0.089, 0.036)
Musculoskeletal System	-0.011		0.005	-0.011	-0.013
(Yes/No)	(-0.026, 0.003)		(-0.019, 0.029)	(-0.027, 0.005)	(-0.040, 0.013)
ESR (mm/hr)			0.035[***]		
(standardized)			(0.022, 0.048)		
Hemoglobin (g/dL)			0.024[**]		
(standardized)			(0.009, 0.038)		
Leukocytes			0.018[***]		
(standardized)			(0.007, 0.028)		
Constant	38.533[***]	37.542[***]	38.625[***]		
	(38.192, 38.874)	(36.460, 38.624)	(38.098, 39.151)		
Observations	16,830	1,188	6,719	13,910	5,992
R^2 (marginal/conditional)	0.17/0.44	0.15/0.29	0.16/0.34	0.19/0.41	0.21/0.39
Log Likelihood	-9,421.74	-659.497	-3,860.08	-7,812.73	-3,609.12
Akaike Inf. Crit.	18,889.48	1,345.00	7,772.16	15,671.46	7,264.24

Note: [*]$p<0.05$; [**]$p<0.01$; [***]$p<0.001$

Table S6. Comparing models using continuous (Model 6 of Table S4) versus categorical biomarkers. Note: anemia refers to hemoglobin<12 g/dL for women and <13 g/dL for men; elevated ESR is >20 mm/hr for ages<45 years and >30 mm/hr for ages 45+; leukocytosis is >10,000 /mm^3. Model includes repeated measures for individual ID, and random effects for community ID and physician ID.

	Dependent: Body temperature	
	Continuous Biomarkers	Categorical Biomarkers
Height (cm)	-0.001	-0.002
	(-0.004, 0.001)	(-0.004, 0.001)
Weight (kg)	0.001	0.001
	(-0.0004, 0.002)	(-0.0003, 0.003)
Age (years)	-0.003***	-0.003***
	(-0.004, -0.002)	(-0.004, -0.002)
Sex (ref =Female)	0.024	-0.009
	(-0.285, 0.334)	(-0.318, 0.299)
Male:Age	0.0001	-0.00001
	(-0.001, 0.001)	(-0.001, 0.001)
Date (years)	-0.057***	-0.059***
	(-0.066, -0.047)	(-0.068, -0.050)
Male:Date	-0.002	-0.001
	(-0.010, 0.005)	(-0.009, 0.006)
Method (ref = "ear")	-0.056	-0.052
	(-0.120, 0.008)	(-0.116, 0.012)
Season (ref = "dry")	0.068***	0.066***
	(0.041, 0.095)	(0.039, 0.093)
Avg ambient temperature (°C)	0.026***	0.027***
	(0.023, 0.030)	(0.023, 0.030)
Infectious/Parasitic Diseases (Yes/No)	-0.006	-0.005
	(-0.030, 0.018)	(-0.029, 0.019)
Blood Diseases (Yes/No)	0.015	0.011
	(-0.030, 0.060)	(-0.035, 0.056)
Nervous System/Sensory (Yes/No)	0.011	0.012
	(-0.016, 0.039)	(-0.016, 0.039)
Respiratory System (Yes/No)	0.061***	0.066***
	(0.035, 0.088)	(0.039, 0.093)
Digestive System (Yes/No)	-0.006	-0.006
	(-0.028, 0.017)	(-0.029, 0.016)
Genitourinary System (Yes/No)	0.025	0.025
	(-0.003, 0.052)	(-0.003, 0.052)
Skin/Subcutaneous (Yes/No)	0.039	0.046
	(-0.020, 0.098)	(-0.013, 0.105)
Musculoskeletal System (Yes/No)	0.005	0.005
	(-0.019, 0.029)	(-0.019, 0.029)
ESR (mm/hr) (standardized)	0.035***	
	(0.022, 0.048)	
Hemoglobin (g/dL) (standardized)	0.024**	
	(0.009, 0.038)	
Leukocytes (standardized)	0.018***	
	(0.007, 0.028)	
Elevated ESR (Yes/No)		0.039**
		(0.016, 0.062)
Anemia (Yes/No)		-0.024
		(-0.053, 0.004)
Leukocytosis (Yes/No)		0.029*
		(0.007, 0.051)
Constant	38.625***	38.716***
	(38.098, 39.151)	(38.189, 39.243)
Observations	6,719	6,719
Log Likelihood	-3,860.08	-3,870.06
Akaike Inf. Crit.	7,772.16	7,792.11
Note:	*p<0.05; **p<0.01; ***p<0.001	

Table S7. Models of temporal changes in biomarkers, RMR, and physical activity. Each variable (erythrocyte sedimentation rate [ESR] (log transformed), leukocyte count [WBC] (log transformed, hemoglobin [Hb], RMR, and % eosinophils was modeled in a separate multilevel model, including in each model community ID and individual ID as random effects. Different variables across models reflect expected confounding factors and/or presence of nonlinear or interaction effects.

| | _Dependent variable: Body Temperature_ | | | | |
| | ESR | Hemoglobin | Leukocytes | RMR | % Eosinophils |
	(1)	(2)	(3)	(4)	(5)
Date (years)	-0.050***	-0.029***	-0.0004	-4,897.0*	-0.232***
	(-0.058, -0.043)	(-0.042, -0.016)	(-0.003, 0.003)	(-9,629.9, -164.0)	(-0.335, -0.129)
Sex (ref = "female")	-1.232***	1.446**	-0.387***	253.7***	3.104
	(-1.733, -0.731)	(0.552, 2.340)	(-0.575, -0.198)	(213.8, 293.5)	(-3.672, 9.881)
Age	-0.012***	0.054***	-0.011***	-1.7*	0.182***
	(-0.018, -0.005)	(0.041, 0.067)	(-0.014, -0.009)	(-3.1, -0.3)	(0.094, 0.270)
Age^2	0.0002***	-0.001***	0.0001***		-0.002***
	(0.0001, 0.0002)	(-0.001, -0.0004)	(0.0001, 0.0001)		(-0.003, -0.001)
Season (ref = "dry")	0.120***	-0.378***	-0.032***		-0.242
	(0.088, 0.153)	(-0.437, -0.319)	(-0.045, -0.019)		(-0.706, 0.221)
Date*Sex	0.018***	0.003	0.011***		-0.020
	(0.008, 0.029)	(-0.016, 0.021)	(0.006, 0.015)		(-0.163, 0.123)
Sex*Age	-0.012*	0.016	-0.002		-0.074
	(-0.023, -0.002)	(-0.004, 0.036)	(-0.006, 0.002)		(-0.212, 0.064)
Sex*Age^2	0.0002***	-0.0005***	0.00002		0.0005
	(0.0001, 0.0003)	(-0.001, -0.0002)	(-0.00002, 0.0001)		(-0.001, 0.002)
Weight (kg)				14.7***	
				(12.4, 17.0)	
Date^2				55.2*	
				(1.2, 109.3)	
Ambient temperature				-1.4	
				(-7.5, 4.8)	
Time since last meal (>10 hrs)				-25.8	
(Ref = 0-4 hrs)				(-95.4, 43.9)	
Time since last meal (5-9 hrs)				-88.4	
(Ref = 0-4 hrs)				(-202.6, 25.7)	
Time of day (morning)				-48.7	
(Ref is "early")				(-152.4, 55.0)	
Time of day (afternoon)				11.3	
(Ref is "early")				(-94.9, 117.5)	
Time of day (evening)				39.9	
(Ref is "early")				(-92.6, 172.5)	
Constant	5.595***	12.765***	9.506***	109,427.3*	22.746***
	(5.243, 5.946)	(12.143, 13.387)	(9.373, 9.640)	(5,747.2, 213,107.4)	(17.913, 27.579)
Observations	7,225	8,546	8,486	1,354	6,733
R^2 (marginal/conditional)	0.18/0.40	0.24/0.53	0.08/0.34	0.34/0.46	0.01/0.22
Log Likelihood	-6,917.726	-14,075.550	-761.064	-9,665.506	-23,937.410
AIC	13,859.450	28,175.090	1,546.127	19,351.010	47,898.810

Note: *p<0.05; **p<0.01; ***p<0.001

Table S8. Generalized additive multilevel models of temporal changes in physical activity and helminth infections. All models were fit using the *brms* package in R, using thin-plate smoothing splines for date terms. We employed a Gaussian model for physical activity and binomial models with logit link function for all helminth models. The model of physical activity includes community ID as a random intercept effect, and helminth models include community ID and individual ID as random intercept effects. Date and age were standardized for all analyses. Whereas a factor-smooth interaction was used to assess patterns over time by sex in the physical activity model, helminth models do not consider separate trends by sex. Reported numbers are posterior medians (95% CIs).

	Dependent variable: Body Temperature				
	Physical activity	Helminth (Ascaris)	Helminth (Hookworm)	Helminth (Strongyloides)	Helminth (Whipworm)
	(1)	(2)	(3)	(4)	(5)
Fixed effects					
Sex (ref = "female")	1799.1				
	(419.6, 3157.4)				
Age	-776.0	0.0	0.15	-0.14	-0.06
	(-2065.9, 532.6)	(-0.14, 0.13)	(0.07, 0.24)	(-0.34, 0.08)	(-0.36, 0.23)
Age^2	-521.2				
	(-1140.6, 111.0)				
Season (ref = "dry")	957.7	-0.15	0.30	0.0	-0.24
	(-996.2, 2898.5)	(-0.36, 0.07)	(0.14, 0.46)	(-0.35, 0.35)	(-0.73, 0.20)
Sex*Age	-2630.7				
	(-4449.6, -742.1)				
Spline: Date		12.2	14.8	-28.7	-2.06
		(2.26, 22.5)	(8.2, 22.2)	(-50.0, -9.57)	(-21.8, 16.3)
Spline: Date (Sex = "female")	-8274.2				
	(-36163.1, 8858.6)				
Spline: Date (Sex = "male")	6264.3				
	(-10772.1, 25728.5)				
Smoothing terms					
SD of Date coefficient		7.54	15.1	20.0	12.0
		(4.1, 13.5)	(9.3, 26.2)	(10.4, 33.3)	(4.2, 22.8)
SD of Date coefficient (Sex = "female")	4354.1				
	(148.5, 14256.4)				
SD of Date coefficient (Sex = "female")	3202.9				
	(106.3, 10812.9)				
Constant	22222.6	-2.7	0.18	-4.7	-6.2
	(20424.7, 24036.5)	(-3.1, -2.3)	(0.01, 0.35)	(-5.3, -4.1)	(-7.3, -5.3)
Observations	550	5821	5821	5821	5821

Table S9. Is the effect of morbidity on body temperature variable over time? Morbidity is operationalized as number of clinical diagnoses per medical visit. Multilevel models of body temperature based on Model 2 of Table 1. To that baseline model we consider the effect of the number of morbid conditions across ICD-10 categories, and the interaction of this variable with date (Model 1), and whether a person had a respiratory illness, and the interaction of this variable with date (Model 2). In both cases, the interaction terms are negative, suggesting morbid conditions are less likely to result in elevated body temperature in later study years. Both models include individual ID, community ID and physician ID as random intercept effects.

| | *Dependent variable: Body Temperature* | |
| | Model (1) | Model (2) |
Predictors	# ICD10 Categories	Respiratory Condition
BMI (kg/m^2)	0.003*	0.003*
	(0.000, 0.005)	(0.000, 0.005)
Age (years)	-0.003***	-0.002***
	(-0.004, -0.002)	(-0.003, -0.001)
Sex (ref =Female)	-0.012	-0.022
	(-0.060, 0.035)	(-0.072, 0.027)
Male:Age	-0.001	-0.001*
	(-0.002, 0.000)	(-0.002, 0.000)
Date (years)	-0.043***	-0.053***
	(-0.050, -0.037)	(-0.056, -0.050)
Male:Date	-0.005*	-0.004
	(-0.009, -0.001)	(-0.008, 0.001)
Method (ref = "ear")	-0.021	-0.054***
	(-0.061, 0.018)	(-0.085, 0.023)
Season (ref = "dry")	0.037***	0.094***
	(0.022, 0.053)	(0.079, 0.110)
Avg ambient temperature (°C)	0.029***	0.030***
	(0.027, 0.031)	(0.027, 0.032)
# ICD10 Categories	0.056***	
	(0.036, 0.076)	
# ICD10 Cat:Date	-0.006***	
	(-0.008, -0.004)	
Respiratory Condition (Yes/No)		0.121***
		(0.070, 0.172)
Respiratory Condition:Date		-0.004
		(-0.009, 0.001)
Constant	36.442***	36.443***
	(36.297, 36.588)	(36.350, 36.537)
Observations	16644	17901
Akaike Inf. Crit.	18695	21217
Note:	*p<0.05; **p<0.01; ***p<0.001	

Table S10. Additional analyses of body composition, with the inclusion of percent body fat or BMI as covariates. Both models are modifications of model 3 in the main paper. In the analysis of BMI, height/weight are excluded as covariates because of high collinearity with BMI.

Predictors	*Dependent variable:* Body temperature	
	Model 3 + body fat	Model 3 + BMI (excluding height/weight)
Height (cm)	-0.002*	
	(-0.004, -0.0004)	
Weight (kg)	0.002***	
	(0.001, 0.004)	
% Body fat	-0.003***	
	(-0.004, -0.001)	
BMI (kg/m^2)		0.003**
		(0.001, 0.006)
Infectious/Parasitic Diseases	-0.009	-0.017
(Yes/No)	(-0.027, 0.008)	(-0.034, 0.001)
Blood Diseases	0.008	-0.003
(Yes/No)	(-0.022, 0.037)	(-0.031, 0.025)
Nervous System/Sensory	-0.013	-0.016
(Yes/No)	(-0.033, 0.007)	(-0.035, 0.003)
Respiratory System	0.074***	0.075***
(Yes/No)	(0.056, 0.092)	(0.059, 0.092)
Digestive System	-0.004	-0.007
(Yes/No)	(-0.019, 0.011)	(-0.021, 0.008)
Genitourinary System	0.019*	0.025**
(Yes/No)	(0.001, 0.038)	(0.007, 0.043)
Skin/Subcutaneous	0.023	0.038*
(Yes/No)	(-0.017, 0.064)	(0.001, 0.075)
Musculoskeletal System	-0.010	-0.012
(Yes/No)	(-0.026, 0.005)	(-0.026, 0.003)
Sex (ref = Female)	0.072	0.135
	(-0.120, 0.264)	(-0.027, 0.298)
Date (years)	-0.059***	-0.054***
	(-0.064, -0.053)	(-0.060, -0.049)
Age (years)	-0.002***	-0.003***
	(-0.003, -0.001)	(-0.003, -0.002)
Season (ref = "dry")	0.027**	0.040***
	(0.010, 0.045)	(0.023, 0.057)
Method (ref = "ear")	-0.027	-0.046*
	(-0.068, 0.013)	(-0.085, -0.007)
Avg ambient temperature	0.029***	0.029***
	(0.027, 0.032)	(0.027, 0.031)
Male:Date	-0.004	-0.005*
	(-0.008, 0.001)	(-0.009, -0.001)

Male:Age	-0.001	-0.001
	(-0.001, 0.0003)	(-0.001, 0.0002)
Constant	38.747***	38.311***
	(38.389, 39.104)	(38.048, 38.575)
Observations	15,434	16,830
R^2 (marginal/conditional)	0.19/0.36	0.17/0.45
Log Likelihood	-8,723.125	-9,414.927
Akaike Inf. Crit.	17,494.250	18,873.850

Table S11. Statistical model of body temperature using a lower upper exclusion cutoff (38°C instead of 39°C). The presented model is otherwise identical to model 3 in the main text.

Independent variable	ß (±95% CI)
Height (cm)	-0.001
	(-0.003, 0.0001)
Weight (kg)	0.002**
	(0.001, 0.002)
Infectious/Parasitic Diseases	-0.016
(Yes/No)	(-0.032, 0.001)
Blood Diseases	-0.006
(Yes/No)	(-0.033, 0.021)
Nervous System/Sensory	-0.012
(Yes/No)	(-0.031, 0.006)
Respiratory System	0.057***
(Yes/No)	(0.041, 0.074)
Digestive System	-0.005
(Yes/No)	(-0.019, 0.008)
Genitourinary System	0.015
(Yes/No)	(-0.002, 0.033)
Skin/Subcutaneous	0.037*
(Yes/No)	(0.001, 0.072)
Musculoskeletal System	-0.006
(Yes/No)	(-0.020, 0.008)
Sex (ref = Female)	0.173*
	(0.014, 0.331)
Date (years)	-0.052***
	(-0.057, -0.047)
Age (years)	-0.002***
	(-0.003, -0.002)
Season (ref = "dry")	0.042***
	(0.026, 0.059)
Method (ref = "ear")	-0.053**
	(-0.091, -0.015)
Avg ambient temperature	0.029***
	(0.027, 0.031)
Male:Date	-0.005**
	(-0.009, -0.002)
Male:Age	-0.001
	(-0.002, 0.0001)
Constant	38.407***
	(38.082, 38.732)
Observations	16,745
Log Likelihood	-8,776.300
Akaike Inf. Crit.	17,598.600
Note:	*$p<0.05$; **$p<0.01$; ***$p<0.001$

Table S12. Statistical model of body temperature using data from Protsiv et al. (2020) with an upper exclusion threshold of 38°C instead of 39°C. For simplicity and because Protsiv et al. (2020) found minimal differences by race, we excluded race from the analysis. The presented analysis also differs from the original analyses in Protsiv et al. (2020) in that both sexes were included in a single model and all independent variables were interacted with sex (as opposed to running two separate models). The use of a 38°C upper threshold had almost no effect on the coefficient for birth year (-0.0028 in model shown versus -0.0027).

Independent variable	ß (±95% CI)
Age (years)	-0.007***
	(-0.007, -0.006)
Sex (ref = "female")	0.240
	(-0.086, 0.566)
Birth year	-0.003***
	(-0.003, -0.003)
Weight (kg)	0.001***
	(0.0005, 0.001)
Height (cm)	-0.001***
	(-0.001, -0.001)
Age:Birth year	0.001***
	(0.0005, 0.001)
Sex:Birth year	-0.0002*
	(-0.0003, -0.00001)
Sex:Weight	0.0004***
	(0.0003, 0.0005)
Sex:Height	-0.0002
	(-0.0005, 0.00002)
Constant	42.677***
	(42.356, 42.998)
Observations	675,151
R^2	0.103

Note: $^*p<0.05$; $^{**}p<0.01$; $^{***}p<0.001$