Swiss TPH

Department of Epidemiology and Public Health

Double burden of infectious and chronic diseases

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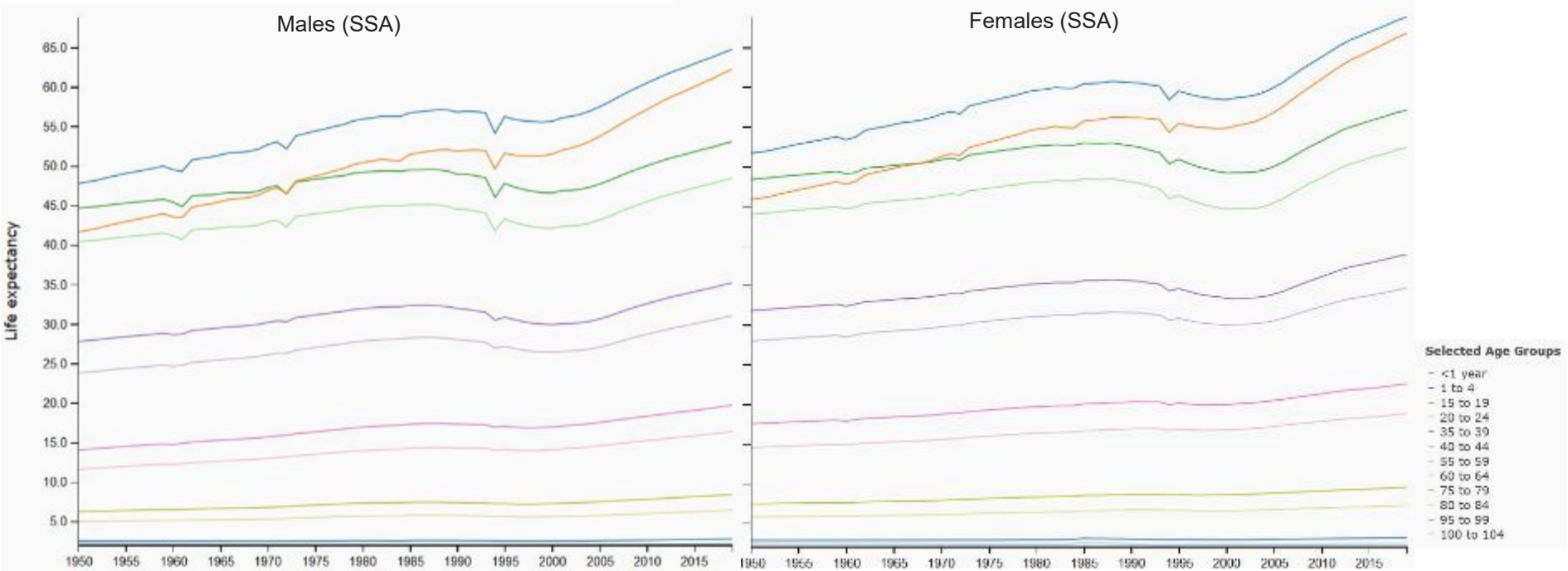
Content

- Epidemiological transition
- A critical role for IDs in NCD aetiology?
- Need for cohorts in LMICs
- The CoDuBu study: An overview
- Perspectives

Epidemiologic transition

Life expectancy in SSA (1950-2015) stratified by sex



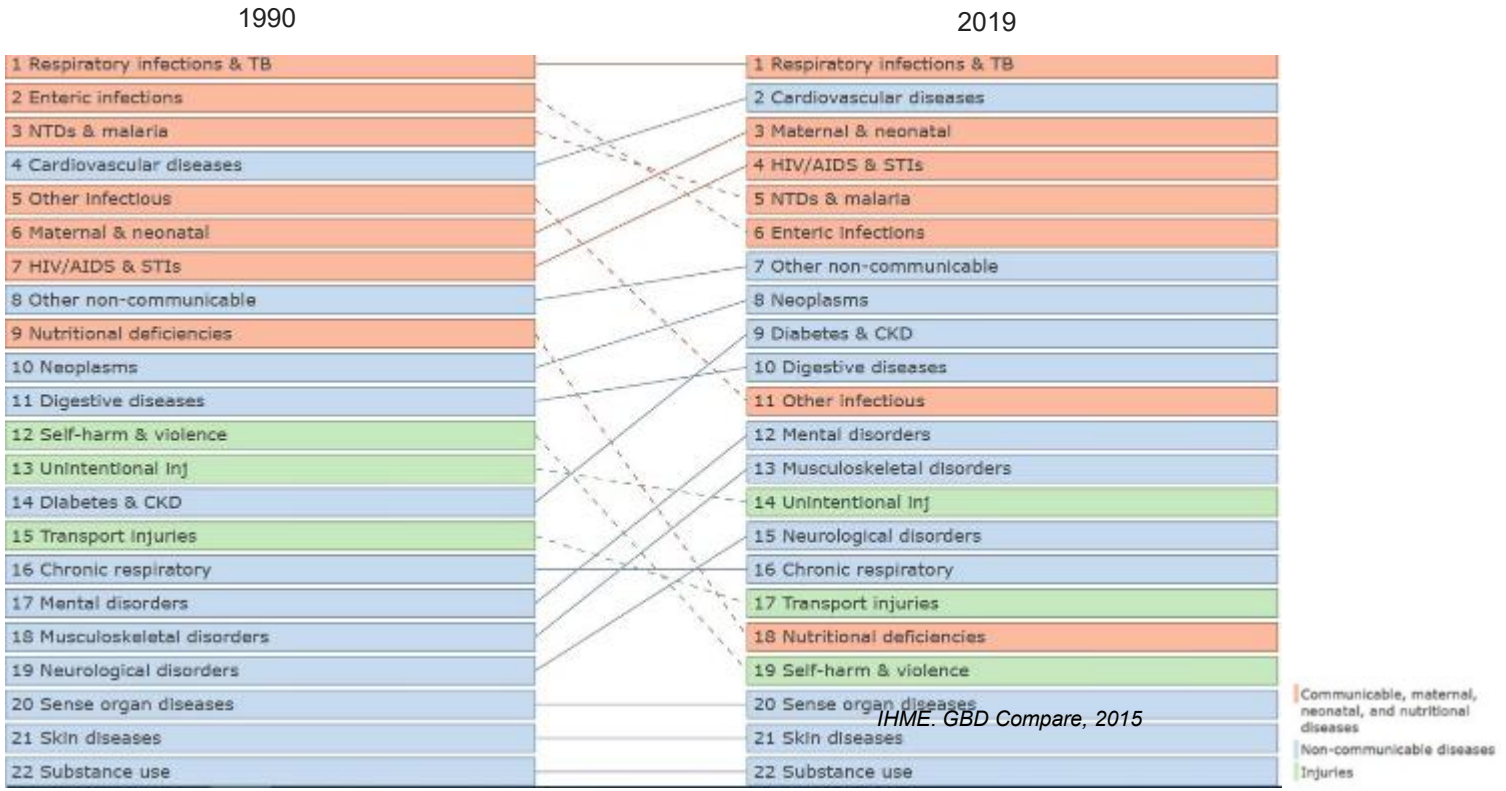
- Public Health control of infections; Health and social programmes, etc.

IHME. GBD Compare, 2015

Epidemiologic transition

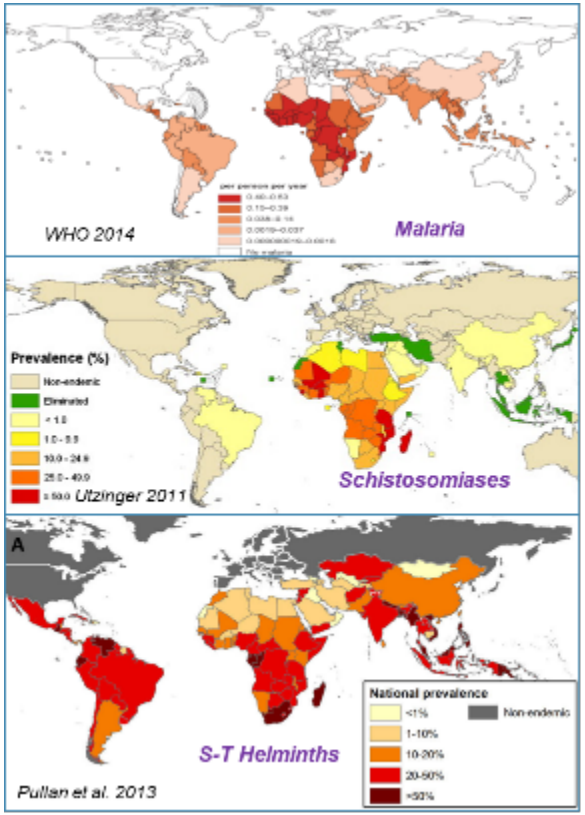
Age-standardized causes and risk factors of DALYs (per 100 000) in SSA

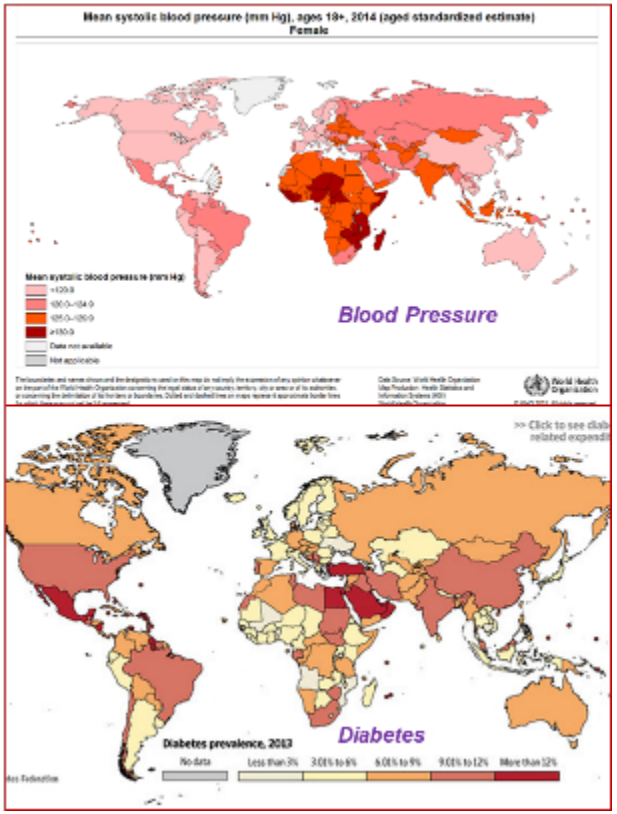
↑ NCDs



IHME. GBD Compare, 2015

Epidemiologic transition



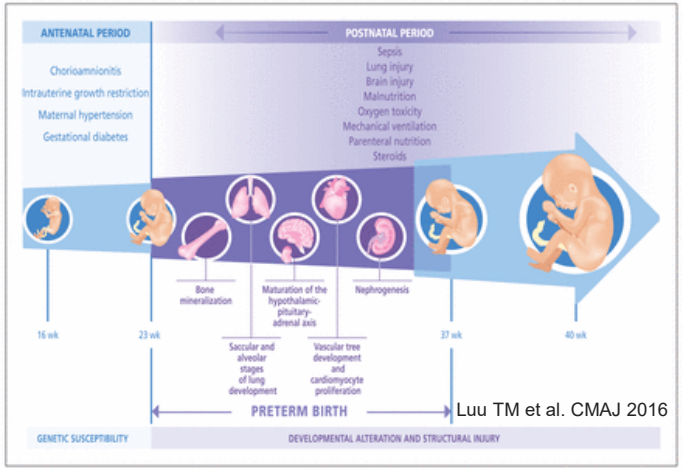


A critical role for ID in NCD?

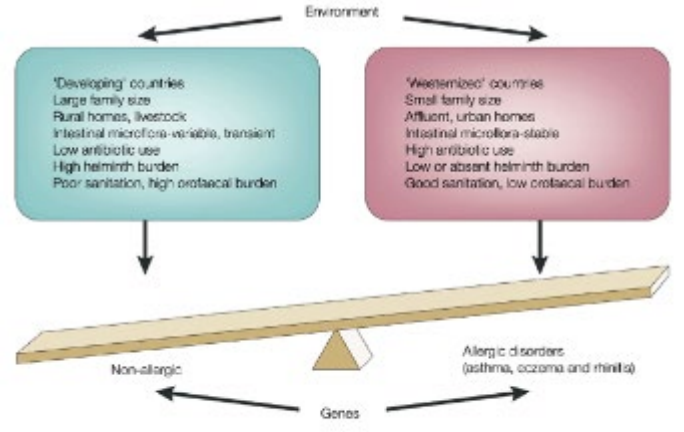
- Barker hypothesis
  - Fetal origins of disease
    (Barker DJ Lancet 1986)

- Hygiene hypothesis
  - Helminth infections ⟶ lower allergic reactions

- Low-grade chronic inflammation
  - Co-infections, other exposures, long-term



Luu TM et al. CMAJ 2016

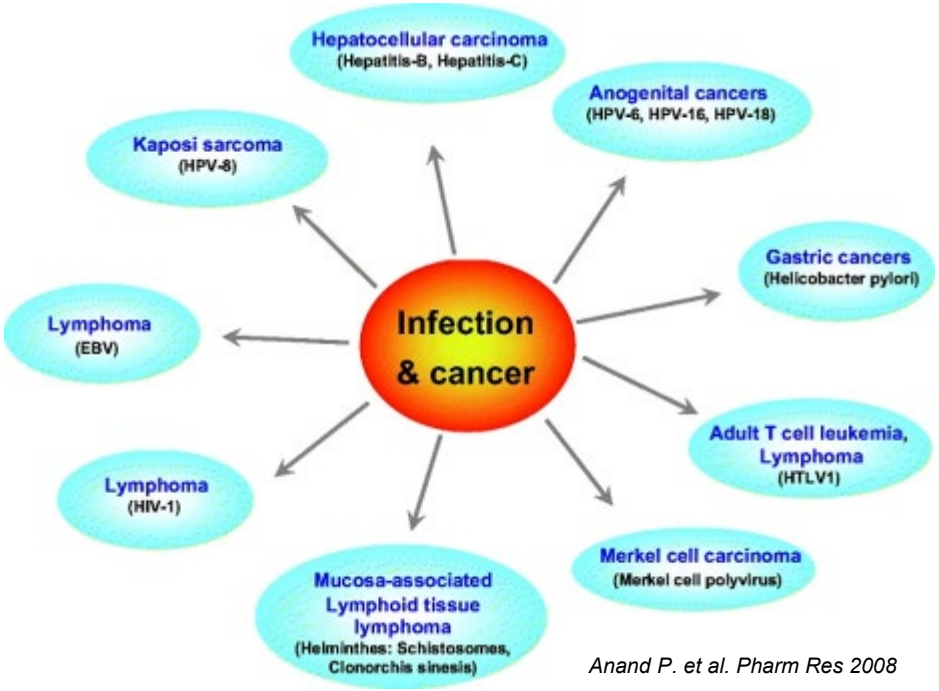


Wills-Karp et al. 2001 Nature Reviews | Immunology

A critical role for ID in NCD?

Shared risks: "*old risks, new diseases*"

- ID and Cancers (16%; 23% LMICs)
- Household AP and respiratory infections, COPD
- Microbial components of PM
- Age-related NCDs and ID



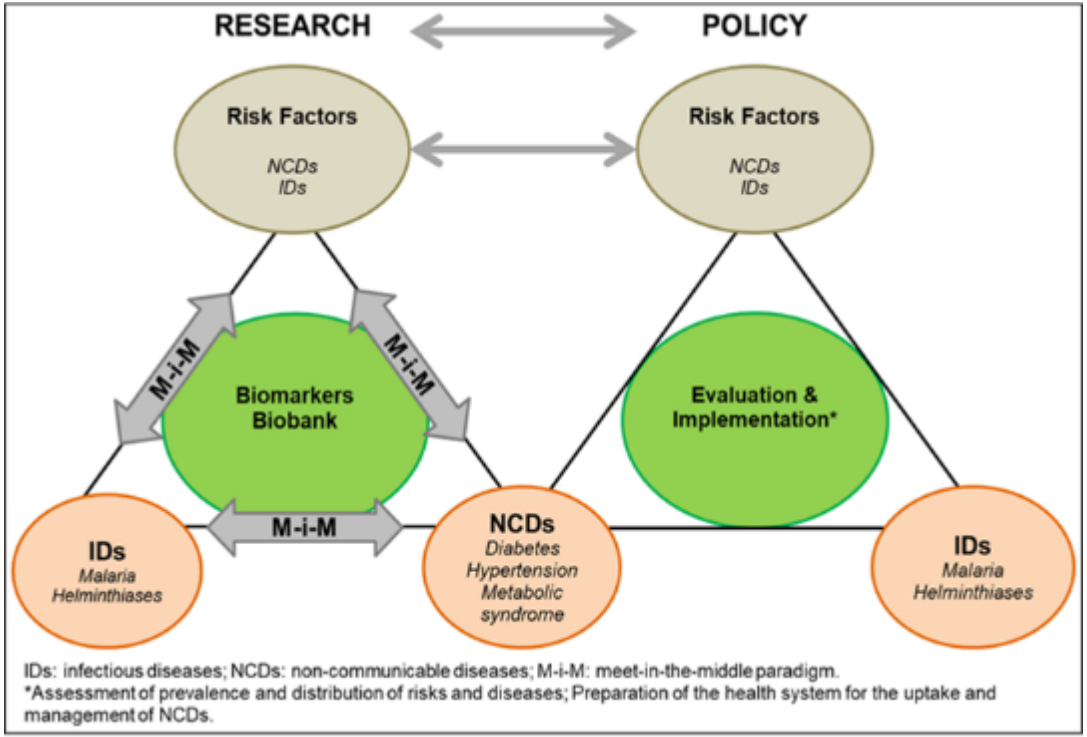
Anand P. et al. Pharm Res 2008

Need for cohorts in LMICs

- ↑ susceptibility to NCDs
- Premature mortality (85% in LMICs).
- Limited understanding of double burden at individual level
- Limited high-quality longitudinal local data

The CoDuBu study: An overview

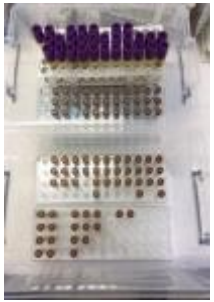
- Population-based
- Research Infrastructure
- Health system preparation
- Baseline 2017
- Taabo HDSS, south-central CI

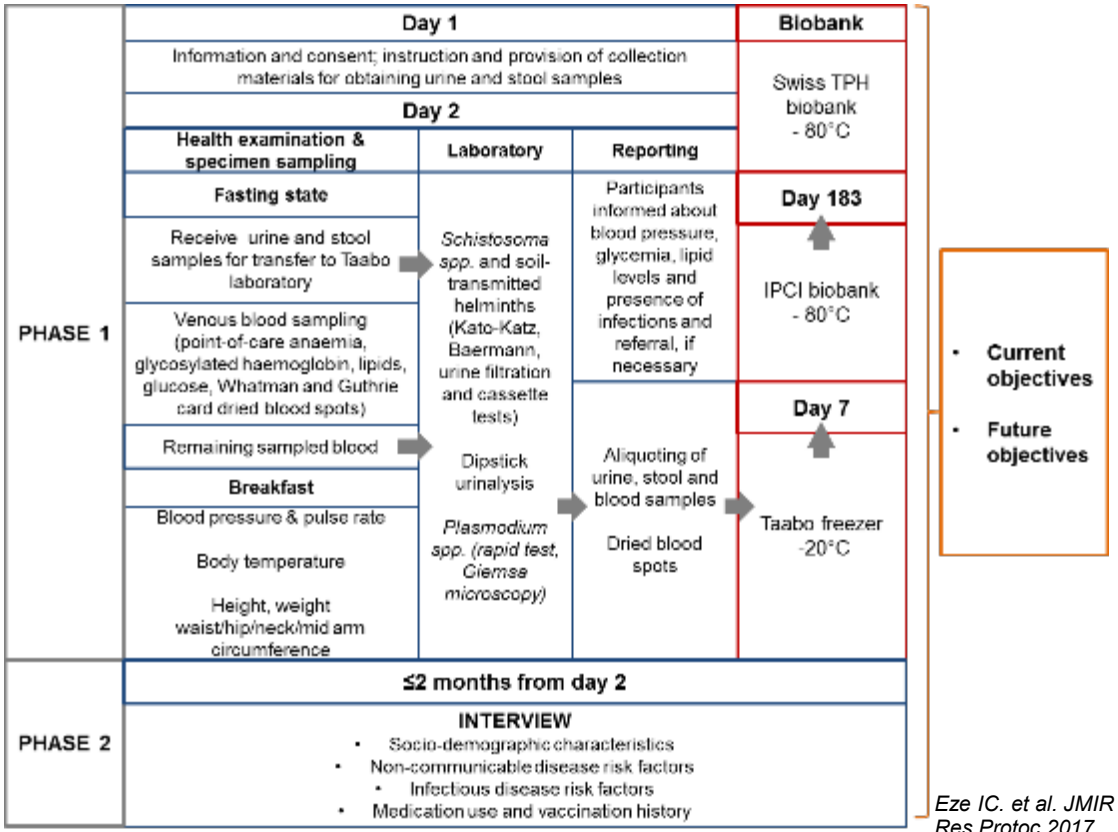


Eze IC. et al. JMIR Res Protoc 2017

The CoDuBu study: An overview

- CoDuBu Biobank
  - 1,000 adults
  - 3 sites
  - 50% urban
  - 50% women
  - 50% >40 years
  - Mirrored Biobank





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The CoDuBu study: An overview

Plasmodium spp. and blood pressure

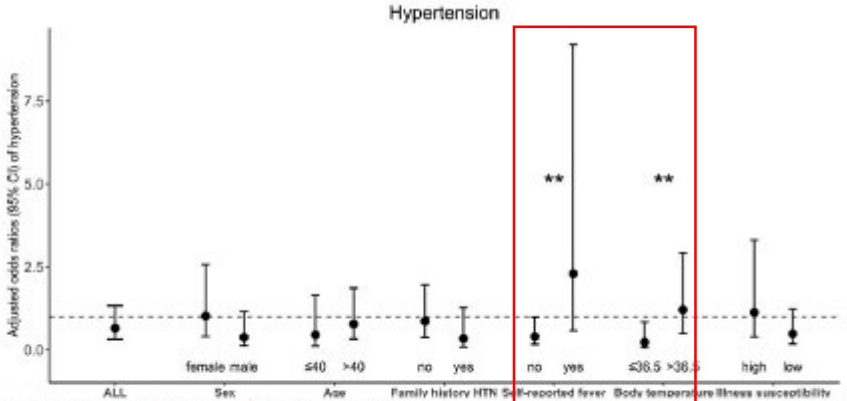


FIGURE 1 Adjusted odds ratios (circular points) and 95% confidence intervals (spikes) of the association between malaria parasitaemia (defined as positive microscopy or rapid diagnostic test) and hypertension phenotypes, stratified by potential modifiers. All estimates were derived from multivariable multinomial logistic regression models comparing odds of prehypertension and hypertension in malaria-positive vs. malaria-negative participants. All models were adjusted for age, sex, formal education, wealth index, area, family history of hypertension, smoking, fruit and vegetable intake, BMI, waist circumference, sedentariness and anaemia. Susceptibility was defined as a self-report of falling ill more frequently than people of the same sex and age group. CI, confidence interval; HTN, hypertension. *P value of interaction is 0.05; **P value of interaction is 0.04.

TABLE 4. Association of hypertension and blood pressure with combinations of malaria parasitaemia, basis of malaria diagnosis and body temperature in the Côte d'Ivoire Dual Burden of Disease Study

		Normotension	Prehypertension	Hypertension	SBP*	DBP*
	N	OR (95% CI)	OR (95% CI)	OR (95% CI)	β (95% CI)	β (95% CI)
Malaria parasitaemia-negative without elevated body temperature	433	Reference	Reference	Reference	Reference	Reference
Malaria parasitaemia-negative with elevated body temperature	464	Reference	1.17 (0.83–1.63)	1.20 (0.80–1.80)	1.89 (−0.29 to 4.06)	0.81 (−0.6 to 2.22)
RDT-only malaria parasitaemia-positive, without elevated body temperature	21	Reference	0.87 (0.31–2.46)	0.30 (0.05–1.65)	−3.62 (−10.70 to 3.10)	−1.95 (−6.43 to 2.54)
RDT-only malaria parasitaemia-positive, with elevated body temperature	25	Reference	0.94 (0.35–2.49)	0.60 (0.16–2.22)	−0.38 (−6.78 to 6.01)	−2.47 (−6.61 to 1.67)
Microscopic malaria parasitaemia-positive, without elevated body temperature	22	Reference	0.50 (0.17–1.48)	n.a	−6.21 (−13.00 to 0.59)	−6.69 (−11.10 to −2.29)
Microscopic malaria parasitaemia-positive, with elevated body temperature	32	Reference	2.13 (0.88–5.16)	3.37 (1.12–10.10)	8.78 (2.92–14.60)	4.08 (0.28–7.88)

Estimates of prehypertension and hypertension were derived from multivariable multinomial logistic regression models whereas those of SBP and DBP were derived from multivariable linear regression models comparing malaria-positive vs. malaria-negative participants. Parasitaemia-negative implies a negative test to both RDT and microscopy. Elevated body temperature implies having self-reported fever or measured body temperature greater than 36.5 °C. All models were adjusted for age, sex, formal education, wealth index, area, family history of hypertension, smoking, fruit and vegetable intake, BMI, waist circumference, sedentariness and anaemia. n.a, not applicable because of lack of hypertension case in the group. β, beta-coefficient; CI, confidence interval; OR, odds ratio; RDT, rapid diagnostic test.
*Models additionally exclude 41 participants on antihypertensive medication.

Journal of Hypertension

Eze IC. et al. 2017

www.jhypertension.com 7

The CoDuBu study: An overview

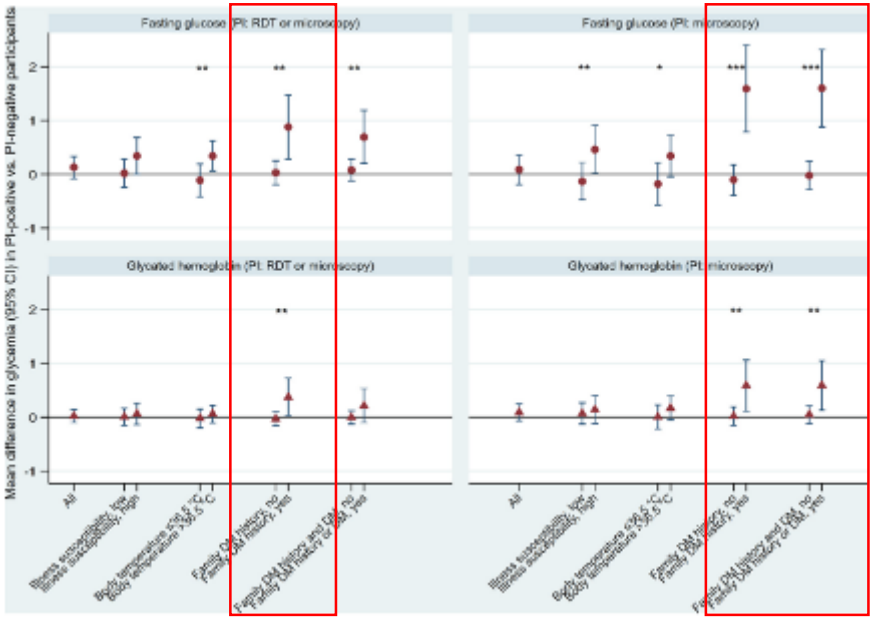
Plasmodium spp. and fasting glucose and HbA1c

Table 2 – Incrementally adjusted associations between *Plasmodium* infection and glycemic control in the CoDuBu study in south-central Côte d'Ivoire.

Estimate	Fasting glucose, FG (mmol/l) β (95% CI)	Glycated hemoglobin, HbA1c (%) β (95% CI)
Model 2	0.17 (−0.06 to 0.38)	−0.03 (−0.15 to 0.10)
Model 3	0.13 (−0.08 to 0.33)	−0.01 (−0.13 to 0.12)
Model 4	0.12 (−0.09 to 0.33)	−0.01 (−0.13 to 0.11)
Model 5	0.11 (−0.10 to 0.31)	−0.01 (−0.14 to 0.11)
Model 6	0.12 (−0.08 to 0.33)	−0.01 (−0.11 to 0.13)
Model 7a	0.13 (−0.08 to 0.33)	0.02 (−0.10 to 0.14)
Model 7b, RDT-PI	0.13 (−0.08 to 0.34)	0.004 (−0.12 to 0.13)
Model 7c, microscopic PI	0.09 (−0.19 to 0.36)	0.09 (−0.07 to 0.25)
Model 8	0.07 (−0.16 to 0.30)	−0.01 (−0.15 to 0.12)
Model 9	0.11 (−0.06 to 0.29)	−0.02 (−0.13 to 0.08)

CoDuBu: Côte d'Ivoire dual burden of disease study. *Plasmodium* infection (PI) was defined as a positive malaria rapid diagnostic test or the microscopic identification of *Plasmodium* species. All beta-coefficients and 95% confidence intervals (CI) derive from linear regression models excluding participants with treated diabetes, and represent increase or decrease in the mean of respective outcome in *Plasmodium* positive vs. negative participants. RDT-PI: *Plasmodium* infection defined as positive rapid diagnostic test. Microscopic PI: *Plasmodium* infection defined as positive microscopy. All models had sample size of 979 except model 8 where sample size was 952.

Model 1: Unadjusted.
Model 2: Model 1 + age and sex.
Model 3: Model 2 + educational level, wealth index and area.
Model 4: Model 3 + family history of diabetes.
Model 5: Model 4 + smoking status, frequency of fruit and vegetable intake and sedentariness.
Model 6: Model 5 + body mass index and waist circumference.
Model 7a: Model 6 + hemoglobin level (primary model).
Model 7b: Model 7a with PI defined only as positive RDT.
Model 7c: Model 7a with PI defined only as positive microscopy.
Model 8: Model 7a, excluding participants with potential clinical malaria (defined as having PI and either anemia or body temperature ≥ 37.5 °C).
Model 9: Model 7a, mutually adjusted i.e. FG model additionally adjusted for HbA1c, and vice versa.



Eze IC. et al. Diabetes Res Clin Pract. 2019

Perspectives

- Life-course exposures

- Integrate –omics markers
  - mediation and translational relevance

- Multi-level longitudinal cohorts, research infrastructure

ACKNOWLEDGEMENT

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Thank you for your attention

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