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Supplementary appendix

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Supplementary Material

This appendix has been provided by the authors to give readers additional information about their work.

Supplement to: Nabity SA, Mponda K, et al. Isoniazid-associated pellagra during mass scale-up of tuberculosis preventive therapy: a case-control study

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Supplementary Methods and Results

General study design

A detailed protocol for this age- and sex-matched case-control study has been published,(1) and we report the results in accordance with Strengthening the Reporting of Observational Studies in Epidemiologist (STROBE).(2) To reduce case selection bias, in particular related to HIV status, we defined a 3–25-km radius catchment area around each clinic and randomly selected three high-volume peripheral outpatient departments to serve as referral origins. We trained staff from all departments within each source clinic to recognize pellagra-like rashes using a standardized job aid. The study reimbursed the cost of patient transport and incentivized clinicians to refer patients to the study. The study-supported structure of source clinics augmented existing routine systems to refer skin conditions in Malawi but did not replace it. Walk-in clients and those referred outside of study-sponsored mechanisms were also eligible for enrollment.

For urine metabolite analyses, we aimed to enroll at least 20 persons in each of the cross tabulated subgroups for pellagra status and exposures of interest (i.e. HIV status, isoniazid status, tuberculosis disease status, and antiretroviral therapy status [ART]). For categories where the standard case-control enrollment process did not yield sufficient urine samples, we purposively sampled persons from the HIV and tuberculosis clinics to provide extra urine samples. The 40 extra urine donors were not included in multivariable modeling. Purposive sampling from the HIV clinic yielded two additional specimens from persons living with HIV (PLHIV) on ART who were not exposed to isoniazid and 18 additional specimens from PLHIV not yet on ART who were not exposed to isoniazid (Table S4). From the TB clinic, purposive sampling yielded 6 samples from PLHIV not taking ART who were exposed to isoniazid and 14 samples from HIV-negative persons exposed to isoniazid as part of multi-drug treatment for TB disease. Because ART uptake is high among PLHIV in Malawi, we did not obtain enough samples to compare urine niacin by ART status.

Symptom resolution among pellagra case-patients at day 30 following prescription of self-administered multi-B vitamin containing 300 mg nicotinamide daily

Table S1 shows the baseline and 30-day subjective symptom profiles for pellagra case-patients. The results are displayed by order of magnitude of improvement per symptom in the right column. All symptoms showed high

levels of improvement over 30 days in the setting of high adherence to daily multi-B vitamin treatment. Patient-reported improvement was greatest for glossitis or oral lesions, diarrhea, weakness, depressed mood, and anorexia. Peripheral neuropathy resolved in a lower proportion of pellagra case-patients 30 days after diagnosis, instruction to discontinue isoniazid, if taking, and daily multi-B vitamin treatment.

Conditional logistic model analysis among subgroups women enrollees, persons exposed to isoniazid within two months and persons with HIV
We applied the multivariable conditional logistic regression model to assess subgroup-specific exposures. In a subgroup analysis among females, pellagra was associated with lactating (Table S2). In a subgroup analysis among isoniazid-exposed patients, pellagra was associated with the duration (months) of isoniazid exposure, and vitamin B6 (pyridoxine) supplementation demonstrated a protective effect (Table S2). ART use and ART duration were not associated with pellagra in a subgroup analysis of HIV-positive enrollees (Table S2).

Niacin metabolite analyses according to pellagra, HIV, and isoniazid detection in urine by IsoScreen
Figure S1 compared niacin metabolite levels using box plots. To aid interpretation of these data, we provided summary statistics for the sub-analyses in Table S3. Niacin metabolite levels correlated with pellagra status and isoniazid exposure, but not with HIV status.

Analytic framework
Table S4 provides a detailed accounting of the inclusion criteria for the primary and secondary analyses we performed. We included 978 enrollees (197 case-patients and 781 controls) in the primary case-control analysis to assess the risk of isoniazid associated with pellagra. Secondary analyses of urine niacin metabolite levels included results from 119 case-patients and 139 controls, as we aimed to analyze urine for a subset of case-patients and approximately one matched control per case-patient. Because we also aimed to analyze niacin metabolite results across participants stratified by isoniazid exposure, HIV status, and antiretroviral therapy exposure, we purposively selected persons attending HIV, tuberculosis, and outpatient clinics. Because nearly all people living with HIV were also taking ART, results could not reliably be stratified by ART status. While we aimed to have ≥20 enrollees in each analytic stratum, enrollments achieved from the HIV and tuberculosis clinics were limited for four subgroups and thus not all subgroups could be reliably analyzed (Table S4, Urine donors). We enrolled purposively sampled attendees strictly to compare the urine niacin metabolites across strata. Data from urine donors were not included in case-patient versus control isoniazid risk analyses.

Missing data for logistic model
We based our conclusions on a *completed-case* analysis of 978 enrollee responses; the *completed-case* set refers to the full set of enrolled case-patients and controls following multiple imputation to resolve missing observations.(3) The *complete-case* set would have included the 912 participants for which we had no missing data on model variables (i.e., excluding those with at least one missing variable).

Assessing referral bias in latency calculations
Figure 2 in the main article illustrates the difference in the time from isoniazid initiation to pellagra rash onset (latency), which we attributed to the season in which enrollees started taking isoniazid. This data subset was complete and thus no data points were censored in the Kaplan-Meier analysis. Those starting isoniazid in the food scarce season had shorter latency periods. Because we trained some community clinicians to identify pellagra and refer presumptive cases to study sites, we considered that this could have led to more prompt detection of pellagra-like rashes. We assessed the possible influence of study-sponsored referrals on latency using a general linear model with these independent variables: started isoniazid within 12 months of rash onset (duration), season in which isoniazid was initiated (i.e., food scarcity; food-scarce season versus all other months), the interaction term for duration *x* food scarcity, and study-sponsored referral status. The estimate for referral status (–0.73) was small and not statistically significant (P=0.08). Because people living with HIV in the study population may have been eligible for continuous isoniazid preventive therapy beginning in September 2017 and enrollment continued through August 2019, enrollees may have been exposed to isoniazid for up to 24 months. Such enrollees may have crossed more than one food scarcity season; therefore, we predicted latency based on the general linear model that accounted for duration isoniazid exposure as either <12 months or ≥12 months (Tab. S6).

Niacin levels by pellagra, IsoScreen isoniazid detection, and HIV status

Figure S1 displays results using box plots. Panel A .

Niacin levels by pellagra, IsoScreen isoniazid detection, tuberculosis disease, and vitamin B6 (pyridoxine) co-administration

Figure S2 displays the results using box plots. Panel A shows niacin levels for persons with and without pellagra stratified by isoniazid exposure and HIV status. Although underpowered for statistical significance, persons with isoniazid exposure had lower niacin levels compared with those without isoniazid exposure, regardless of HIV status. As outlined in Table S4, the samples from persons without pellagra (NP) and having isoniazid exposure were derived from urine donors taking multi-drug therapy for tuberculosis (6 with HIV and 14 without HIV infection) and appeared to have somewhat higher niacin levels. Because pyridoxine is an essential cofactor for niacin synthesis,(4) we assessed niacin levels according to pyridoxine co-administration (Panel B). In Panel B, pyridoxine appeared to increase niacin levels among those without pellagra ($P<0.0001$). This relationship did not hold for those with pellagra, as niacin levels remained low despite pyridoxine use ($P=0.99$).(5) Because *Mycobacterium tuberculosis* may affect niacin status via the kynurenine pathway,(6, 7) we also measured niacin metabolite levels according to both tuberculosis disease and pyridoxine use (Panel C). Persons who were taking multi-drug treatment for tuberculosis had niacin levels that trended higher, regardless of TB disease status. Niacin levels were also higher among those with TB disease, regardless of pyridoxine use. This suggests a synergistic effect; however, small sample sizes limited the interpretation of such patterns.

Clinical outcome

As noted in the main article, most pellagra case-patients adhered to 30 days of multi-B vitamin treatment and had clinical improvement upon reassessment. Of note, however, study clinicians treated three of five pellagra case-patients who erroneously continued daily isoniazid preventive therapy through the 30-day follow-up with an additional 30-day course of multi-B vitamins due to disproportionate rash persistence. These observations suggest that discontinuing isoniazid is important for clinical resolution of pellagra despite multi-B vitamin therapy. Finally, two enrollees with isoniazid-associated pellagra were hospitalized during the 30-day observation and one died. Neither hospitalization event was believed to be associated with pellagra.

Table S1. Pellagra symptom profiles for 197 persons with pellagra and 781 age- and sex-matched persons without pellagra presenting to three dermatology clinics at enrollment and symptom resolution at 30-day pellagra case-patient follow-up

	Enrollment n/N (%)	**30-day follow-up** n/N (%)	**Symptom resolution** %
Glossitis or oral lesions	91/197 (46)	5/194 (3)	97
Diarrhea	59/197 (30)	16/194 (8)	90
Weakness	104/197 (53)	22/194 (11)	83
Depressed mood	87/197 (44)	24/193 (12)	82
Anorexia	90/196 (46)	22/194 (11)	82
Confusion or altered mental status	77/196 (39)	25/193 (13)	79
Insomnia	70/197 (36)	20/192 (10)	78
Anxiety or agitation	70/197 (36)	24/194 (12)	75
Nausea, dyspepsia, or emesis	98/197 (50)	38/194 (20)	73
Dizziness	82/195 (42)	36/194 (19)	68
Arthralgia	87/197 (44)	41/193 (21)	66
Headache	101/197 (51)	48/194 (25)	62
Peripheral neuritis	100/197 (51)	54/194 (28)	58

[*] *Diarrhea and altered mental status were exclusionary criteria for control enrollment and are therefore not reported here.*

Table S2. Unadjusted and adjusted odds of having pellagra by isoniazid exposure status and covariates separately assessed among female enrollees, person with isoniazid exposure within the last two months, and persons with HIV

		Crude odds ratio (95% CI)		Adjusted odds ratio (95% CI)	
Female enrollees		**165**		**653**	
Isoniazid, last two months	No	1 (Ref)		1 (Ref)	
	Yes	52·8	(25·8–108·1)	59·1	(14·1–247·7)
	Missing*				
HIV positive†	No	1 (Ref)		1 (Ref)	
	Yes	37·6	(19·0–74·2)	3·9	(1·0–15·0)
	Missing*				
Food security	Secure/ mildly insecure	1 (Ref)		1 (Ref)	
	Moderately-Highly insecure	3·9	(2·2–7·1)	3·1	(0·9–10·4)
	Missing*				
Dietary diversity score	≥ Median score (30·5)	1 (Ref)		1 (Ref)	
	< Median score	1·5	(1·1–2·2)	2·3	(1·0–5·2)
Underweight‡	No	1 (Ref)		1 (Ref)	
	Yes	3·7	(2·0–7·0)	5·1	(1·5–17·5)
	Missing*				
Alcohol consumption (14-day)	None	1 (Ref)		1 (Ref)	
	Some	0·4	(0·1–1·6)	1·5	(0·1–19·3)
Referral status	Walk-in patient	1 (Ref)		1 (Ref)	
	Referral	9·6	(6·3–14·6)	16·3	(6·3–42·4)
Additional medications§	None	1 (Ref)		1 (Ref)	
	≥ 1 medication	1·1	(0·6–2·2)	2·7	(0·6–11·5)
	Missing*				
Maize source	Likely fortified	1 (Ref)		1 (Ref)	
	Likely not fortified¶	1·1	(0·4–2·8)	0·1	(0·0–1·5)
	Missing*				
Household food aid (past year)	No	1 (Ref)		1 (Ref)	
	Yes	1·9	(1·0–3·8)	1·1	(0·2–4·8)
	Missing*				
Regular income‖	No	1 (Ref)		1 (Ref)	
	Yes	0·5	(0·3–0·7)	0·6	(0·2–1·4)
Pregnant	No	1 (Ref)		1 (Ref)	
	Yes	1·2	(0·4–3·5)	3·5	(0·3–45·2)
	Missing*				
Lactating	No	1 (Ref)		1 (Ref)	
	Yes	3·6	(2·3–5·6)	3·2	(1·0–10·5)
Parity**		1·1	(1·0–1·2)	0·9	(0·7–1·1)
	Missing*				

Isoniazid-exposed enrollees		**161**		**96**	
HIV positive[†]	No	1 (Ref)		1 (Ref)	
	Yes	1	—	1	—
Food security	Secure/ mildly insecure	1 (Ref)		1 (Ref)	
	Moderately-Highly insecure	1·5	(0·6–4·2)	0·7	(0·1–4·0)
	Missing[*]				
Dietary diversity score	≥ Median score (30·5)	1 (Ref)		1 (Ref)	
	< Median score	1·6	(0·8–3·2)	1·9	(0·7–5·6)
Underweight[‡]	No	1 (Ref)		1 (Ref)	
	Yes	1·5	(0·6–4·2)	1·7	(0·2–13·4)
	Missing[*]				
Alcohol consumption (14-day)	None	1 (Ref)		1 (Ref)	
	Some	0·6	(0·1–3·3)	0·3	(0·0–5·2)
Referral status	Walk-in patient	1 (Ref)		1 (Ref)	
	Referral	7·0	(2·7–18·4)	7·9	(2·1–30·2)
Additional medications[§]	None	1 (Ref)		1 (Ref)	
	≥ 1 medication	1·0	(0·3–3·4)	1·5	(0·2–13·0)
Maize source	Likely fortified	1 (Ref)		1 (Ref)	
	Likely not fortified[¶]	0·5	(0·1–3·1)	1·6	(0·1–34·2)
Household food aid (past year)	No	1 (Ref)		1 (Ref)	
	Yes	1·2	(0·3–5·0)	1·6	(0·2–13·4)
	Missing[*]				
Regular income[‖]	No	1 (Ref)		1 (Ref)	
	Yes	0·5	(0·2–1·0)	0·6	(0·2–2·3)
Isoniazid duration (months)[**]		1·1	(1·0–1·2)	1·1	(1·0–1·3)
	Missing[*]				
Concurrent B6 supplement	No	1 (Ref)		1 (Ref)	
	Yes	0·3	(0·1–0·8)	0·2	(0·0–1·0)
	Missing[*]				
Concurrent TB treatment[††]	No	1 (Ref)		1 (Ref)	
	Yes	0·8	(0·1–4·4)	1·0	(0·1–11·9)
	Missing[*]				
HIV-positive enrollees		**172**		**206**	
Isoniazid, last two months	No	1 (Ref)		1 (Ref)	
	Yes	17·8	(6·5–48·9)	30·4	(8·6–108·1)
	Missing[*]				
Food security	Secure/mildly insecure	1 (Ref)		1 (Ref)	
	Moderately-highly insecure	1·8	(0·9–3·7)	1·4	(0·5–4·3)
	Missing[*]				
Dietary diversity score	≥ Median score (30·5)	1 (Ref)		1 (Ref)	

	< Median score	1·7	(1·1–2·8)	1·2	(0·5–2·5)
Underweight‡	No	1 (Ref)		1 (Ref)	
	Yes	2·4	(1·0–5·8)	2·5	(0·7–8·6)
	Missing*				
Alcohol consumption (14-day)	None	1 (Ref)		1 (Ref)	
	Some	0·3	(0·1–1·2)	0·3	(0·0–2·5)
Referral status	Walk-in patient	1 (Ref)		1 (Ref)	
	Referral	4·7	(2·6–8·5)	7·7	(3·1–19·1)
Additional medications§	None	1 (Ref)		1 (Ref)	
	≥ 1 medication	1·4	(0·5–3·6)	1·6	(0·4–6·6)
Maize source	Likely fortified	1 (Ref)		1 (Ref)	
	Likely not fortified¶	0·7	(0·2–2·1)	0·4	(0·0–2·7)
	Missing*				
Household food aid (past year)	No	1 (Ref)		1 (Ref)	
	Yes	1·3	(0·5–3·4)	1·2	(0·2–6·0)
	Missing*				
Regular income‖	No	1 (Ref)		1 (Ref)	
	Yes	0·4	(0·2–0·8)	0·5	(0·2–1·5)
HIV duration (years)**		1	(0·9–1·0)	1·0	(0·9–1·1)
	Missing*				
Concurrent ART	Yes	1 (Ref)		1 (Ref)	
	No	0	—	—	—
	Missing*				

SD=standard deviation. The Fisher Exact test compared proportions and the t-test compared means between persons with pellagra (case-patients) and those without pellagra (controls) at study enrollment.

* All missing values underwent multiple imputation prior to analysis.

† HIV was collinear with isoniazid exposure within 2 months (Phi=0·54)

‡ Underweight defined as body mass index <18·5 kg/m^2; or, for pregnant women, mid upper arm circumference <23 cm

§ Not including medications used for treating tuberculosis or HIV disease

¶ Home or locally milled maize were considered unlikely fortified

‖ Among enrollees >15 years of age

** Integer-valued covariate treated as continuous; odds ratio indicates the change in odds per each 1-unit increase in the covariate

†† Concurrent tuberculosis disease treatment included multiple drugs, of which one was isoniazid

Table S3. Summary statistics for the 2-PYR:1-MN ratio according to pellagra, HIV infection, and isoniazid detection in urine via IsoScreen for the case-control study to assess the relationship between isoniazid and pellagra in Malawi

	n	Mean (±SD)	Median (IQR)
Panel A:	169		
Isoniazid detected	82	3.22 (4.26)	2.19 (1.05–3.56)
Isoniazid not detected	87	4.28 (3.71)	2.96 (1.75–5.19)
Panel B:	169		
Not pellagra: isoniazid detected	18	4.10 (2.68)	3.02 (2.05–6.62)
Not pellagra: isoniazid not detected	45	3.94 (2.97)	3.02 (1.83–5.62)
Pellagra: isoniazid detected	64	2.98 (3.94)	1.85 (0.94–3.26)
Pellagra: isoniazid not detected	42	4.65 (5.31)	2.72 (1.63–4.93)
Panel C:	252		
HIV infection	166	3.76 (4.04)	2.51 (1.46–4.71)
No HIV infection	86	3.49 (3.65)	2.64 (1.53–3.72)
Panel D:	252		
Not pellagra: HIV infection	61	4.01 (2.89)	3.01 (1.86–5.97)
Not pellagra: no HIV infection	72	3.07 (2.35)	2.73 (1.78–3.61)
Pellagra: HIV infection	105	3.61 (4.59)	2.32 (1.14–3.56)
Pellagra: no HIV infection	14	5.61 (7.16)	2.14 (1.14–7.29)
Panel E:	169		
Not pellagra: HIV infection, isoniazid detected	17	4.19 (2.72)	3.02 (2.05–6.62)
Not pellagra: HIV infection, isoniazid not detected	36	4.20 (3.18)	3.19 (1.71–5.98)
Not pellagra: no HIV infection, isoniazid detected	1	2.43	2.43
Not pellagra: no HIV infection, isoniazid not detected	7	3.01 (1.86)	2.71 (1.83–3.53)
Pellagra: HIV infection, isoniazid detected	62	2.62 (2.47)	1.85 (0.96–3.21)
Pellagra: HIV infection, isoniazid not detected	40	4.65 (5.43)	2.72 (1.62–4.82)
Pellagra: no HIV infection, isoniazid detected	1	0.51	0.51
Pellagra: no HIV infection, isoniazid not detected	2	4.73 (3.15)	4.73 (2.50–6.95)

Refers to data displayed in manuscript Figure S1. 169 had both IsoScreen and HIV results known.

2-PYR=milligrams of l-methyl-2-pyridone-5-carboxamide per liter urine; 1-MN=milligrams of 1-methylnicotinamide per liter urine; SD = standard deviation; IQR = interquartile range; Detected = positive or indeterminate urine IsoScreen result; Not detected = negative urine IsoScreen result

Table S4. Analytic cascade for reporting results and eligibility for inclusion by study subpopulation for the pellagra case-control investigation at three referral dermatology clinics in Malawi

	Pellagra	**Not pellagra**				
			Urine donors			
Descriptor	**Cases***	**Controls***	**HIV+ Antiretroviral therapy+ Isoniazid-**	**HIV+ Antiretroviral therapy- Isoniazid+**	**HIV- Antiretroviral therapy- Isoniazid+**	**HIV+ Antiretroviral therapy- Isoniazid-**
Source	Skin clinic	Skin clinic	HIV clinic	Tuberculosis clinic	Tuberculosis clinic	HIV clinic
Sampling	Sequential	Random	Purposive	Purposive	Purposive	Purposive
N	197	781	2	6	14	18
Tables 1 & 2 *Case-control analyses (symptoms, multivariate risk assessment, and outcomes)* *Selection: none*	197	781	No	No	No	No
Figure 2 & Table S2 *Kaplan-Meier analysis* *Selection: case-control enrollees with isoniazid-associated pellagra who initiated isoniazid within 12 months of enrollment*	48	--	No	No	No	No
Figure 3 *Niacin metabolite analyses* *Selection: case-control enrollees for whom niacin metabolites were analyzed*	119	139	No	No	No	No
Figure S1 *Niacin metabolite analyses* *Selection: case-control enrollees and urine donors for whom niacin metabolites were analyzed*						
Panel A *Selection: None*	Yes	Yes	Yes	Yes	Yes	Yes
Panel B *Sub-selection: Not pellagra*	Yes	Yes	Yes	Yes	Yes	Yes
Panel C *Sub-selection: Not pellagra and taking isoniazid within 2 months of enrollment*	No	Yes	No	Yes	Yes	No

252 enrollees with niacin metabolites and HIV status known; 169 with known niacin metabolites, IsoScreen result, and HIV status.

* Selected for epidemiological analyses, regardless of HIV, antiretroviral therapy, or isoniazid status

Table S5. Explanatory general linear model for time from isoniazid initiation to rash onset (latency) for 160 isoniazid-associated pellagra case-patients enrolled in the case-control investigation at three referral dermatology clinics in Malawi

Term	Parameter	Standard error	t	P	95% Confidence Limits
Intercept	9.83	0.54	18.37	<0.001	8.78, 10.89
Duration of isoniazid ≥12 months (duration)*	8.58	0.66	13.04	<0.001	7.28, 9.88
Initiated isoniazid during food scarcity season (food scarcity)†	–4.98	0.79	–6.31	<0.001	–6.54, –3.42
Interaction: (duration) x (food scarcity season)	3.63	0.96	3.79	<0.001	1.74, 5.53
Duration ≥12 months, food scarce season	7.24	--	--	--	--
Duration ≥12 months, not food scarce season	8.58	--	--	--	--
Duration <12 months, food scarce season	–4.98	--	--	--	--
Duration <12 months, not food scarce season	0	--	--	--	--
Referred by study-sponsored site‡	–0.73	0.42	–1.73	0.08	–1.56, 0.10

Adjusted R^2=0.75; N=160

* Started isoniazid at least 12 months prior to rash onset

† Food scarcity season defined by the months November through March; the not food scarcity season includes all other months

‡ Persons referred to the dermatology clinic as presumptive pellagra cases as part of the study-sponsored referral system

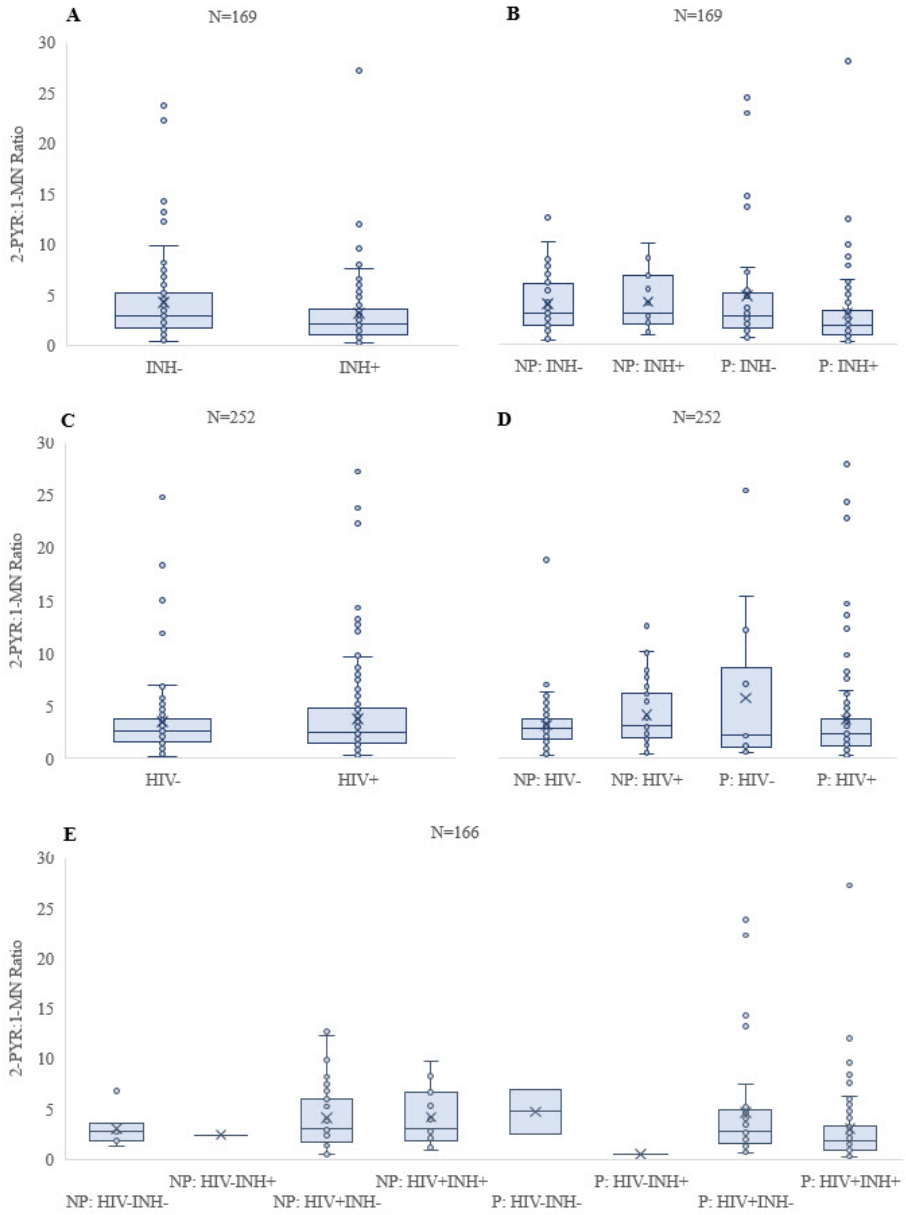
Table S6. Predicted time from isoniazid initiation to rash onset (latency) for 160 isoniazid-associated pellagra case-patients enrolled in the case-control investigation at three referral dermatology clinics who initiated isoniazid within 12 months of rash onset according to season of isoniazid initiation and study-sponsored referral status in Malawi

Season isoniazid initiated*	Referral status†	Predicted latency (months)	95% Confidence Interval
Not food scarce season	Walk-in	9.8	8.8, 10.9
	Referred	9.1	8.1, 10.1
Food scarce season	Walk-in	4.9	3.5, 6.2
	Referred	4.1	2.8, 5.4

* Food scarcity season included the months November through March; the not food scarcity season included all other months

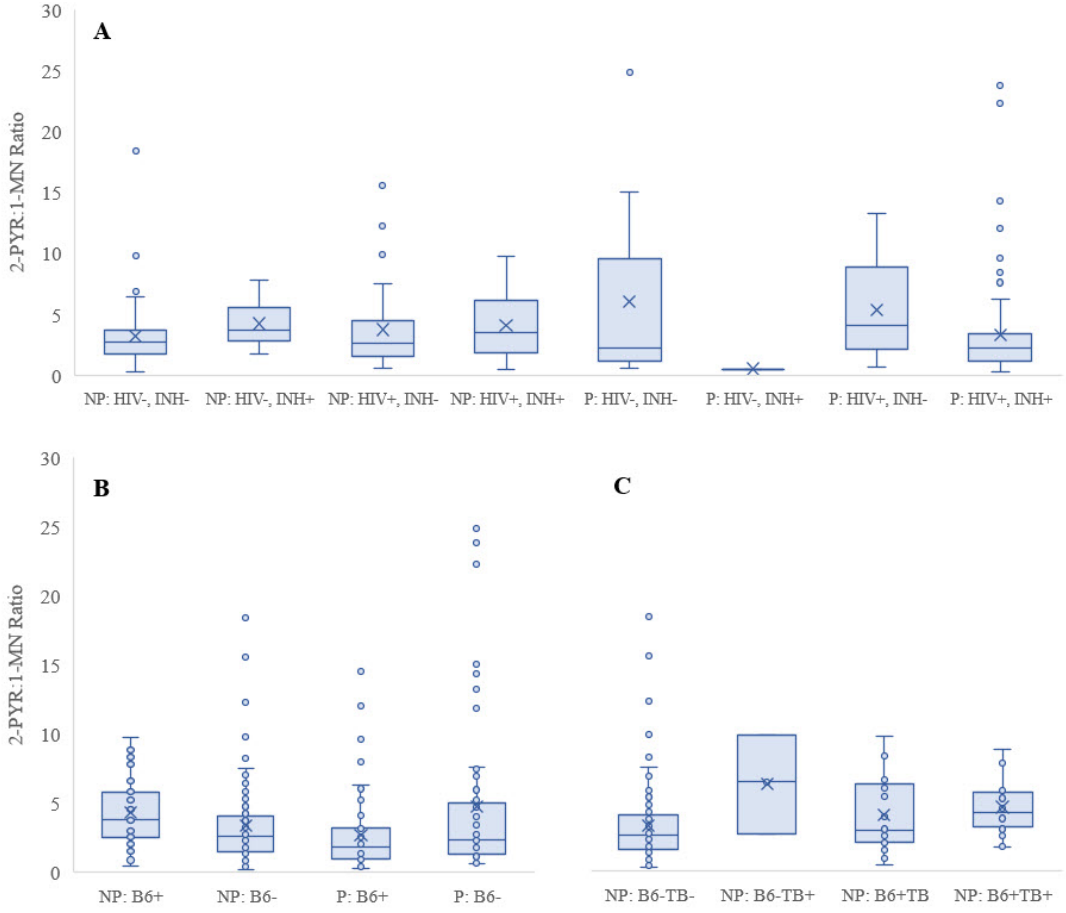
† Referred = persons referred to the dermatology clinic as presumptive pellagra cases as part of the study-sponsored referral system

Figure S1. Ratio of urine 2-PYR:1-MN for persons with and without pellagra according to urinary isoniazid metabolite detection and documented HIV infection during the pellagra case-control investigation in Malawi



Legend: 2-PYR=milligrams of 1-methyl-2-pyridone-5-carboxamide per liter urine; 1-MN=milligrams of 1-methylnicotinamide per liter urine; X=mean value; INH-=no isoniazid exposure; INH+=isoniazid exposure; NP=not pellagra; P=pellagra; HIV-=human immunodeficiency virus infection not present; HIV+=human immunodeficiency virus infection present. **Panel A**: 2-PYR:1-MN ratio for 169 persons according to urinary isoniazid metabolite result; **Panel B**: 2-PYR:1-MN ratio for 169 persons according to urinary isoniazid metabolite result and pellagra status; **Panel C***:* 2-PYR:1-MN ratio for 252 persons according to documented HIV infection status; **Panel D***:* 2-PYR:1-MN ratio for 252 persons according to documented HIV infection and pellagra status; **Panel E***:* 2-PYR:1-MN ratio for 169 persons according to urinary isoniazid metabolite result, documented HIV infection, and pellagra status

Figure S2. Ratio of urine 2-PYR:1-MN by pellagra, isoniazid, HIV, tuberculosis disease, and vitamin B6 (pyridoxine) status during the pellagra case-control investigation in Malawi



2-PYR=milligrams of 1-methyl-2-pyridone-5-carboxamide per liter urine; 1-MN=milligrams of 1-methylnicotinamide per liter urine; X=mean value; NP=not pellagra; P=pellagra; B6=vitamin B6 (pyridoxine) supplementation; TB=tuberculosis disease treatment with multiple drugs.
Panel A: 2-PYR:1-MN ratio according to HIV and isoniazid exposures for people with pellagra (left panel) and without pellagra (right panel) (296)
Panel B: 2-PYR:1-MN ratio by vitamin B6 use among persons with and without pellagra (287)
Panel C: 2-PYR:1-MN ratio by vitamin B6 use among persons without pellagra, according to multi-drug TB disease treatment status (174)

Supplementary Material References

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