

# My work with Africans

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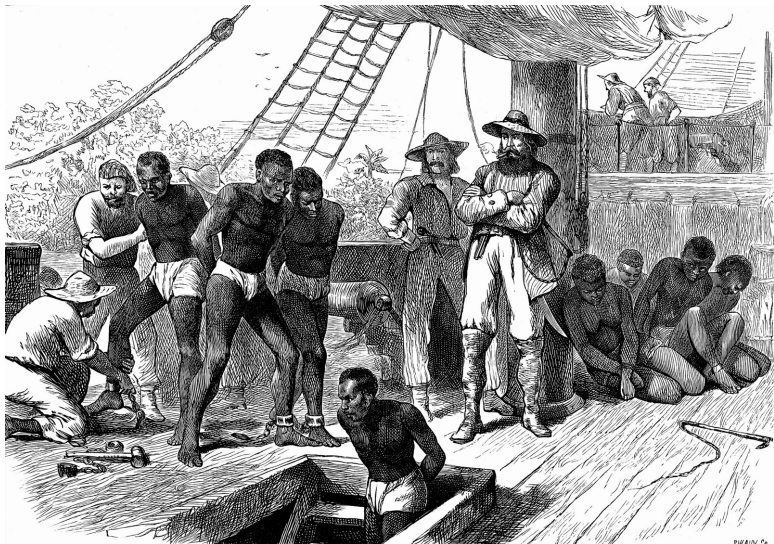
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# Africa



**Africa has been and continues to be exploited by outsiders  
.. most notably by Europeans and North Americans**

# Slave trade



... This was not enough ...

# Stealing of minerals



... This was not enough ...

# Scientific exploitation

**1000s of papers are being published in the name of Africa with little/no benefit to the continent, most of these papers do not have African authors.**

# Scientific exploitation

**More than 95 percent of paper about Africa published in Science, Nature and PNAS have no African authors.**

# Scientific exploitation

**Culprits include RSS presidents ... scientists at top universities in the UK and elsewhere ...**



# Scientific exploitation - An example

DOI: 10.1111/rssa.12833

ORIGINAL ARTICLE



## **A modelling strategy to estimate conditional probabilities of African origins: The collapse of the Oyo Empire and the transatlantic slave trade, 1817–1836**

Ashton Wiens<sup>1</sup>  | Henry B. Lovejoy<sup>2</sup> | Zachary Mullen<sup>3</sup> |  
Eric A. Vance<sup>4</sup> 

... a paper published by the JRSSA.



# EducateAfrica charity

**I established this EducateAfrica**

**<https://educate-africa.github.io/> in 2017 to give free education and to inspire researchers in Africa to work on important problems affecting their continent.**

# EducateAfrica charity

**Initially started as a teaching charity, teaching undergraduate / postgraduate courses for university students in Africa, teaching performed using zoom, four hours a week.**

# EducateAfrica charity - Courses taught on-line included

- ▶ Introduction to R
- ▶ Extreme values
- ▶ Statistical inference
- ▶ Regression
- ▶ Reliability

# EducateAfrica charity

**Also gave short courses in specialised topics during in-person visits.**

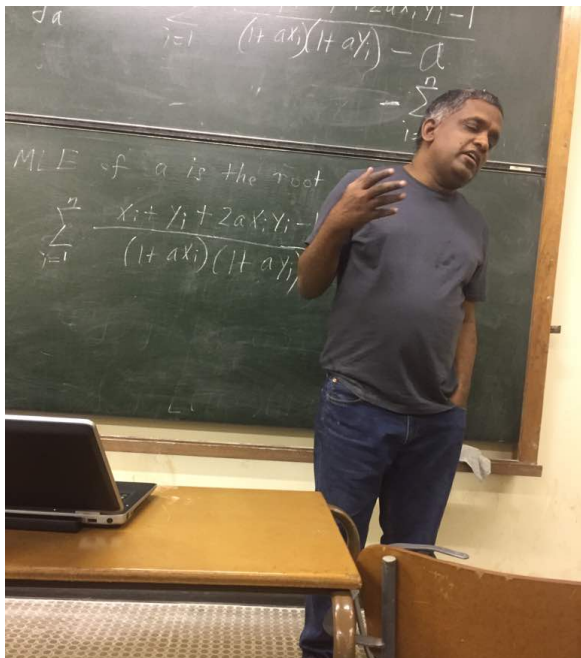
# Photos with students in Zimbabwe



## Photos with students in Zimbabwe (contd)



## Photos with students in Zimbabwe (contd)



# EducateAfrica charity

**Since 2019, the charity has added a research component ..  
to inspire and guide researchers in Africa to work on  
important problems ... and to supervise Masters / PhD  
students in Africa.**



# Conditions for research in Africa

- ▶ **limited access to computers (many departments do not have more than a few computers),**
- ▶ **lack of computer software,**
- ▶ **lack of collaborations within the continent,**
- ▶ **poor funding towards research,**
- ▶ **lack of qualified staff to guide young researchers (many departments do not have staff holding PhDs),**
- ▶ **high teaching load,**
- ▶ **constant electricity cuts,**
- ▶ **poor internet connectivity.**

# Currently working with researchers in 25+ countries

**Currently working with researchers from 25+ African countries, including Cameroon, Nigeria, Madagascar, Ghana, Senegal, Morocco, Ethiopia, Niger, Guinea, South Africa, Burkina Faso, Burundi, Zambia, Zimbabwe, Botswana, Malawi, South Sudan, Uganda, Tanzania, Egypt, Libya, Mauritius, Botswana, Somalia, ....**

# Currently working with researchers in 25+ countries

**Most research are applied statistics, some are methodological.**

**Currently working with researchers in 25+ countries**

**Most researchers do not have PhDs .. also supervising 6  
PhD students in Africa**

# Example 1 - modeling of TB in Africa

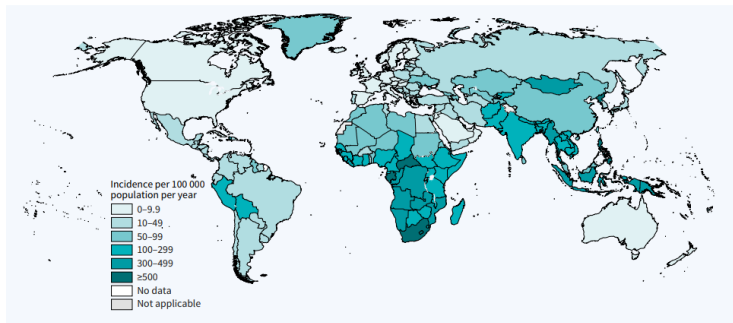


Figure: Estimated TB incidence rates, 2021 (WHO, 2022).

# Example 1 - modeling of TB in Africa

**Data on TB incidence rate obtained for 52 of the African countries for 2000, 2001, ..., 2021.**

## Example 1 - modeling of TB in Africa

Let  $Z_t$  denote the number of new cases of TB reported in year  $t$  and  $\mathcal{F}_t$  the history of the number of new cases up to and including year  $t$ . Models fitted included

$$Z_t \mid \mathcal{F}_{t-p} \sim \text{Poisson} (\beta_0 + \cdots + \beta_{p-1}Z_{t-p+1})$$

and

$$Z_t \mid \mathcal{F}_{t-p} \sim \text{Negative Binomial} (\beta_0 + \cdots + \beta_{p-1}Z_{t-p+1}, \phi)$$

for  $p \geq 1$ .

# Example 1 - modeling of TB in Africa

Best fits determined by AIC, BIC, ...



# Example 1 - modeling of TB in Africa

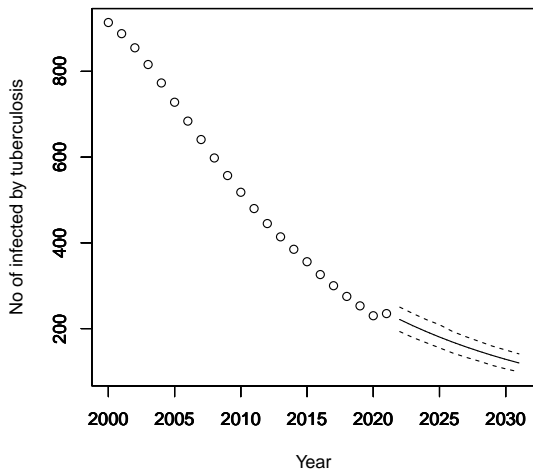


Figure: Predictions for Botswana.

# Example 1 - modeling of TB in Africa

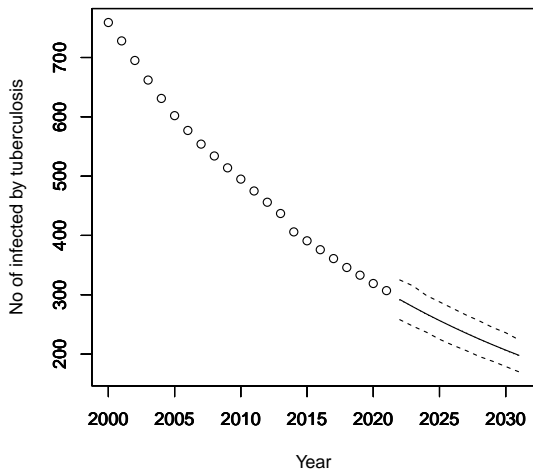


Figure: Predictions for Zambia.

## Example 2 - modeling of extreme drought in Africa



Figure: Droughts in Africa.

## Example 2 - modeling of extreme drought in Africa

**Data were annual maximums and annual minimums of SPIs from 1993 to 2022 for 54 countries in Africa.**

## Example 2 - modeling of extreme drought in Africa

Annual maximum SPIs fitted by

$$\exp \left[ - \left( 1 + \xi \frac{x - \mu}{\sigma} \right)^{-\frac{1}{\xi}} \right]$$

**for**  $\mu - \frac{\sigma}{\xi} \leq x < \infty$  **if**  $\xi > 0$ ,  $-\infty < x < \infty$  **if**  $\xi = 0$  and  
 $-\infty < x \leq \mu - \frac{\sigma}{\xi}$  **if**  $\xi < 0$ .  $\mu$  and  $\sigma$  allowed to vary  
**polynomially with respect to year.**

## Example 2 - modeling of extreme drought in Africa

Annual minimum SPIs fitted by

$$1 - \exp \left[ - \left( 1 - \xi \frac{x^* + \mu^*}{\sigma^*} \right)^{-\frac{1}{\xi^*}} \right] \quad (1)$$

**for**  $-\mu^* + \frac{\sigma^*}{\xi^*} < x^* < \infty$  **if**  $\xi^* < 0$ ,  $-\infty < x^* < \infty$  **if**  $\xi^* = 0$  **and**  
 $-\infty < x^* < -\mu + \frac{\sigma^*}{\xi^*}$  **if**  $\xi^* > 0$ .  $\mu^*$  **and**  $\sigma^*$  **allowed to vary**  
**polynomially with respect to year.**

## Example 2 - modeling of extreme drought in Africa

Best fits determined by AIC, BIC, ...

## Example 2 - modeling of extreme drought in Africa

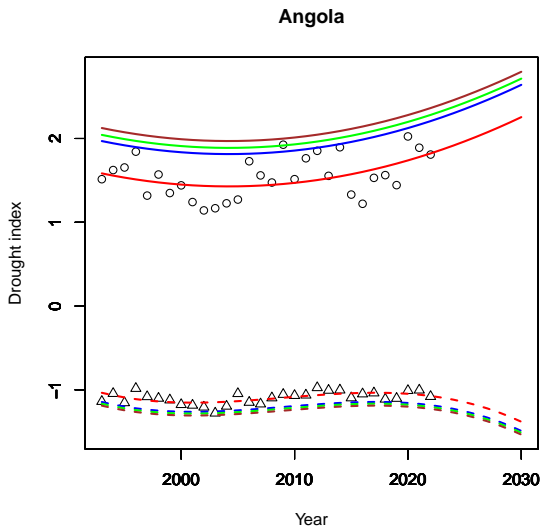


Figure: Predictions for Angola.



## Example 2 - modeling of extreme drought in Africa

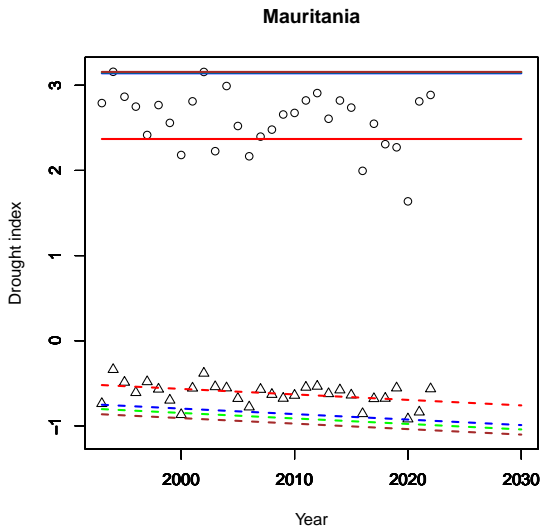


Figure: Predictions for Mauritania.

## Example 3 - dependence between extreme rainfall and extreme temperature in Senegal

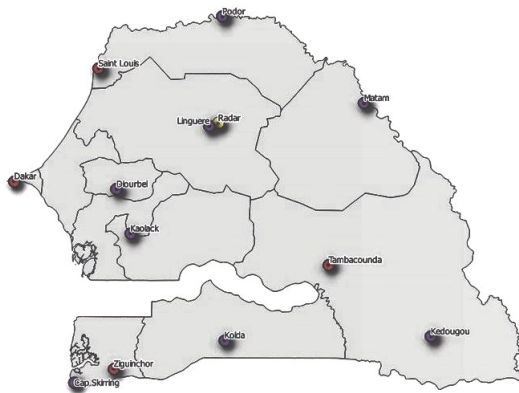


Figure: Locations of the 12 stations.

## Example 3 - dependence between extreme rainfall and extreme temperature in Senegal

**Data were maximum of monthly rainfall and maximum of monthly temperature for the 12 stations.**

## Example 3 - dependence between extreme rainfall and extreme temperature in Senegal

Fitted models included bivariate asymmetric logistic copula, bivariate Hüsler-Reiss copula, bivariate asymmetric negative logistic copula, bivariate bilogistic copula, bivariate negative bilogistic copula, bivariate Coles-Tawn copula, bivariate mixed copula, bivariate  $t$  extreme value copula, bivariate Gaussian copula, bivariate  $t$  copula ...

## Example 3 - dependence between extreme rainfall and extreme temperature in Senegal

Best fits determined by AIC, BIC, ...

## Example 3 - dependence between extreme rainfall and extreme temperature in Senegal

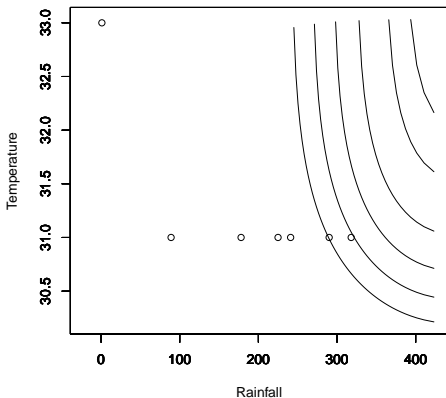


Figure: Fitted joint quantile function for Diourbel.

## Example 3 - dependence between extreme rainfall and extreme temperature in Senegal

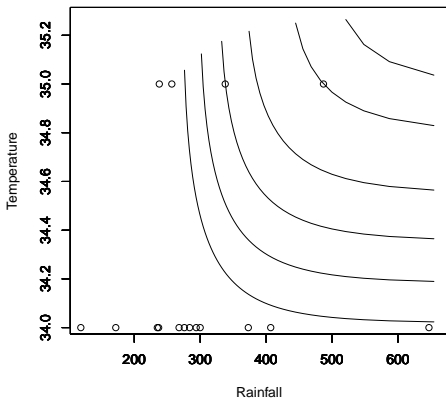


Figure: Fitted joint quantile function for Tambacounda.

# Research impact

- ▶ **Many previously unemployed now have permanent positions in academia, industries, and government institutions.**
- ▶ **Many previously held temporary contracts now have permanent positions in academia, industries, and government institutions.**
- ▶ **Several have gained promotions to higher ranks.**
- ▶ **Many have successfully completed Masters degrees in the continent.**
- ▶ **Many others have gained funding to pursue PhDs in the continent or abroad.**



# Selected Refereed Journal Papers Published with Researchers in Nigeria

- ▶ **Modelling climate finance flows in sub-Saharan Africa (with Q. C. Chukwudum). Environmental Modeling and Assessment, 2023, 1-22.**
- ▶ **Integer time series models for tuberculosis in Africa (with O. O. Ojo and M. Kebe). Scientific Reports, 13, 2023, article number 11443.**
- ▶ **An extreme value analysis of daily new cases of COVID-19 for sixteen countries in west Africa (with O. O. Ojo). Scientific Reports, 13, 2023, article number 10814.**
- ▶ **Forecasting Value at risk and expected shortfall of foreign exchange rate volatility of major African currencies via GARCH and dynamic conditional correlation analysis (with E. Afuecheta, I. E. Okorie and G. E. Nzeribe). Computational Economics, 2022, 1-34.**

# Selected Refereed Journal Papers Published with Researchers in Ghana

- ▶ **Bayesian modeling of maternal mortality in Ghana (with D. Jakperik and M. J. Adjabui). African Journal of Reproductive Health, 27, 2023, 57-66.**
- ▶ **Heavy tailed modeling of automobile claim data from Ghana (with C. Kwofie). Journal of Computational and Applied Mathematics, 405, 2022, 113947.**

# Selected Refereed Journal Papers Published with Researchers in Zimbabwe

- ▶ **The impact of socio-demographic factors on the survival of cancer patients in Zimbabwe (with I. E. Okorie and R. Moyo). Scientific Reports, 11, 2021, article number 12309.**
- ▶ **Statistical modeling of annual highest monthly rainfall in Zimbabwe (with K. Musara and M. Wiegand). Scientific Reports, 12, 2022, article number 7698.**
- ▶ **Mixture modeling of hospital charge in Zimbabwe (with N. Mangava). Heliyon, 9, 2023.**

# Selected Refereed Journal Papers Published with Researchers in Zambia

- ▶ **Closed form estimators for a multivariate gamma distribution (with V. M. Nawa). *Statistics*, 57, 2023, 482-495.**
- ▶ **New closed form estimators for a bivariate gamma distribution (with V. M. Nawa). *Statistics*, 57, 2023, 150-160.**
- ▶ **New closed form estimators for the beta distribution (with V. M. Nawa). *Mathematics*, 11, 2023, article number 2799.**
- ▶ **Closed form estimators for a bivariate beta distribution (with V. M. Nawa). *Journal of Computational and Applied Mathematics*, 2023, to appear.**

# Selected Refereed Journal Papers Published with Researchers in Egypt

- ▶ **Inference for a geometric-poisson-Rayleigh distribution under progressive-stress accelerated life tests based on type-I progressive hybrid censoring with binomial removals (with A. H. Abdel-Hamid and A. F. Hashem). Quality and Reliability Engineering International, 34, 2018, 649-680.**
- ▶ **The beta transmuted-H family for lifetime data (with A. Afify and H. Yousof). Statistics and Its Interface, 10, 2017, 505-520.**
- ▶ **An overview of discrete distributions in modelling COVID-19 data sets (with E. M. Almetwally and S. Dey). Sankhyā A, 85, 2023, 1403-1430.**

# Selected Refereed Journal Papers Published with Researchers in Senegal

- ▶ **Statistical modeling of monthly maximum temperature in Senegal (with K. N'dri). Environmental Research Communications, 4, 2022, article number 075002.**
- ▶ **Socio-economic and demographic impacts on the full awareness of the methods for controlling/preventing the spread of COVID-19 among social media users in some African countries at the onset of the pandemic (with I. E. Okorie, E. Afuecheta and C. G. Alaabo). BMC Research Notes, 14, 2021, 1-6.**
- ▶ **Dependence between extreme rainfall and extreme temperature in Senegal (with K. N'dri). Environmental Modeling and Assessment, 2023, doi: 10.1007/s10666-023-09932-y**

# Selected Refereed Journal Papers Published with Researchers in Uganda and Ethiopia

- ▶ **Hydrodynamic modelling of floods and estimating socio-economic impacts of floods in Ugandan River Malaba Sub-catchment (with A. Mubialiwo, A. Abebe, N. S. Kawo, J. Ekolu and C. Onyutha). Earth Systems and Environment, 6, 2022, 45-67.**

# Selected Refereed Journal Papers Published with Researchers in South Africa

- ▶ **A predictive leverage statistic for quantile regression with measurement errors (with E. Ranganai). Communications in Statistics-Simulation and Computation, 46, 2017, 6385-6398.**



# Selected Refereed Journal Papers Published with Researchers in Uganda and Mauritius

- ▶ **Re-visiting the COVID-19 analysis using the class of high ordered integer-valued time series models with harmonic features (with N. M. Khan, A. D. Soobhug, N. Youssef, S.Fedally and Z. Heetun). Healthcare Analysis, 2022, article number 100086.**

# Selected Refereed Journal Papers Published with Researchers in Guinea

- ▶ **The confluent hypergeometric beta distribution (with M. Kebe). *Mathematics*, 11, 2023, article number 2169.**
- ▶ **Change point analysis of the effects of the Russo-Ukrainian war on wheat flour prices in selected African countries (with M. Kebe). *Applied Economics*, 2023, 1-15.**
- ▶ **Explicit expressions for most common entropies (with M. Kebe). *Entropy*, 25, 2023, article number 534.**

# Selected Refereed Journal Papers Published with Researchers in Libya

- ▶ **The Kumaraswamy GEV distribution (with S. Eljabri).  
Communications in Statistics-Theory and Methods, 46,  
2017, 10203-10235.**

# Annual workshop to celebrate black heroes in statistics

**The first workshop was held in November 2023, details in <https://blackheroesstatistics.wordpress.com/>.**

**THANK YOU!**