# Using Machine Learning to build and *use* Relative Risk profiles for ART

## in South Africa and Nigeria

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*Palindrome Data, Cape Town, South Africa*

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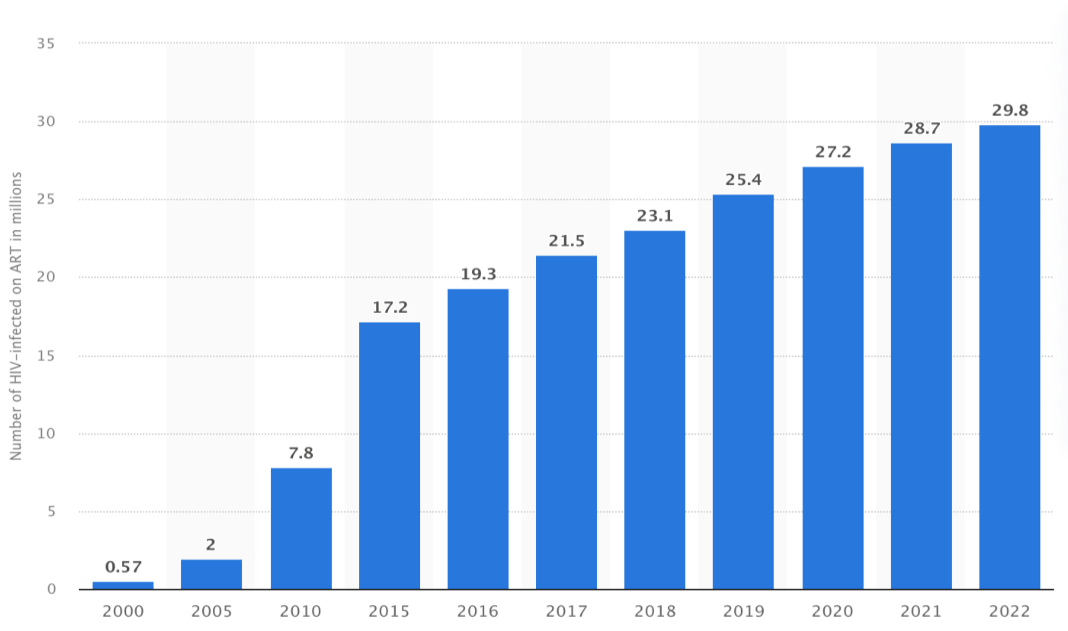
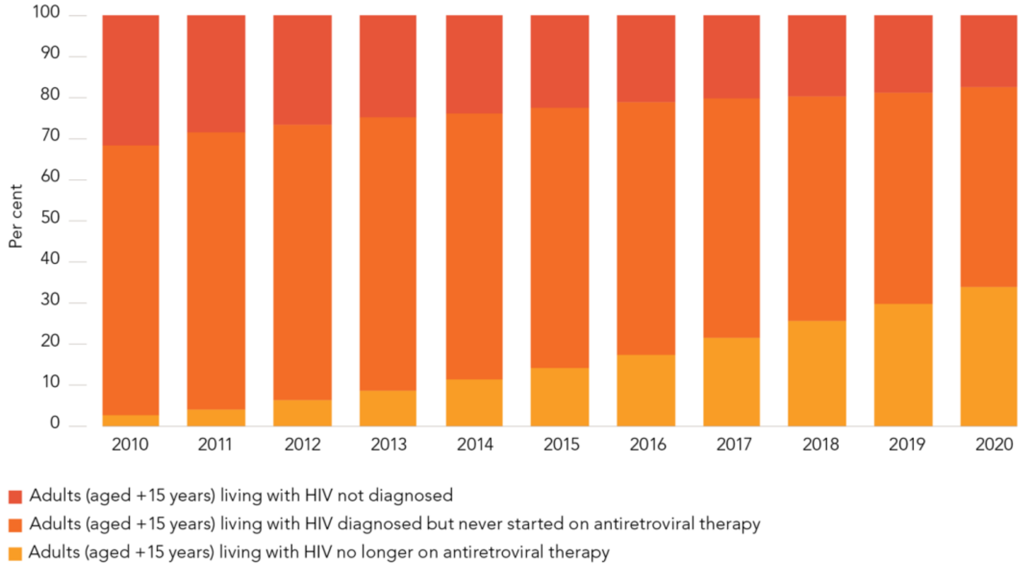
# HIV is ***trying*** to Personalise Care at Scale

## Access to ART worldwide has increased




## Disengagement from care has also increased

**People living with HIV not on antiretroviral therapy, adults (aged 15+ years), South Africa, 2010–2020**

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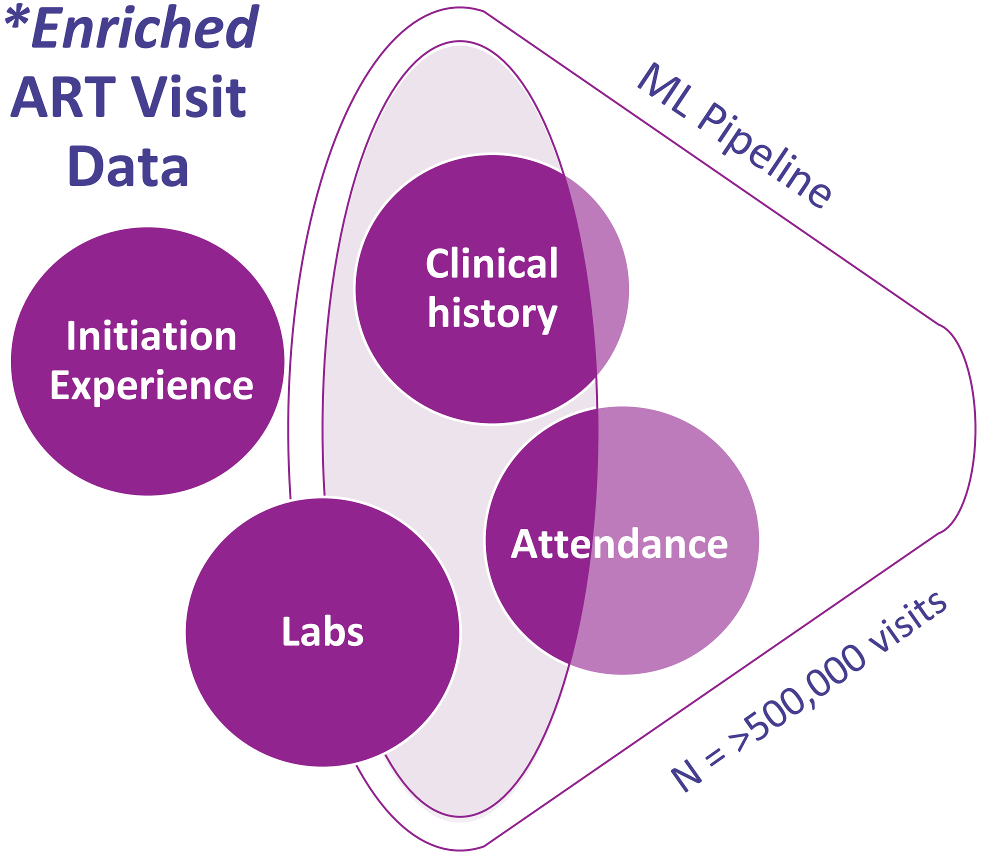
# Method:
## Predict Interruption using EMR visit data & ML classifier



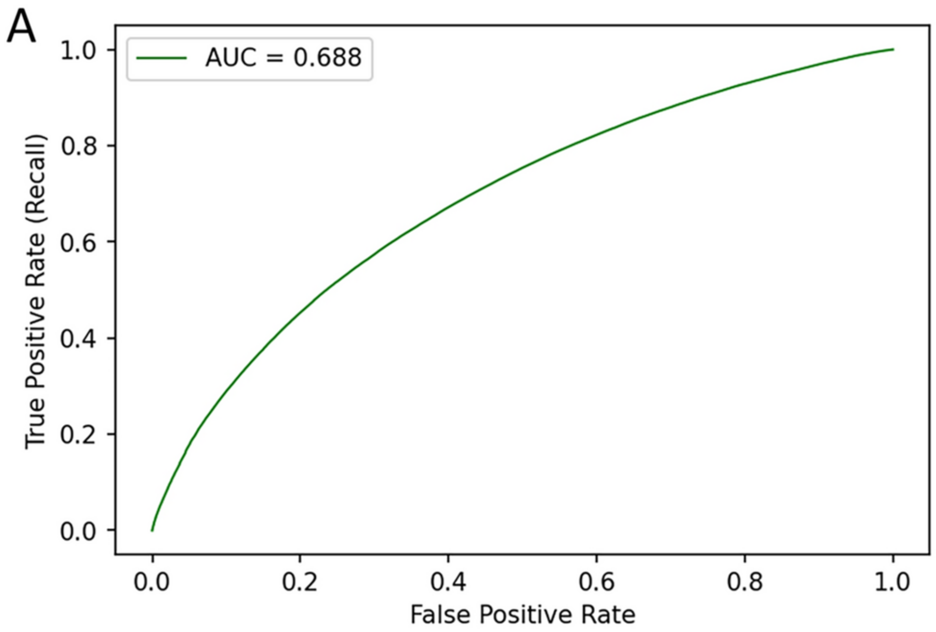

**Interruption-in-Treatment Predictions**

**Screening Tool**

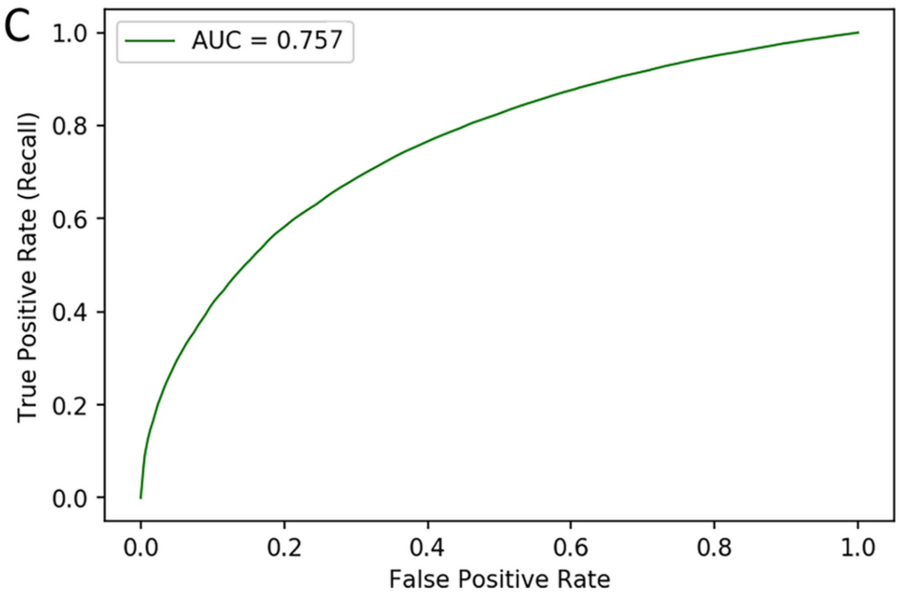
**Maskew et al, 2022, https://www.nature.com/articles/s41598-022-16062-0*

**Results:** The results indicated that prior patient behaviour and treatment history were extremely important in predicting both visit attendance and viral load results in these datasets and that traditional demographic predictor variables were less useful than behavioural indicators

## Interruptions in Treatment Classifier

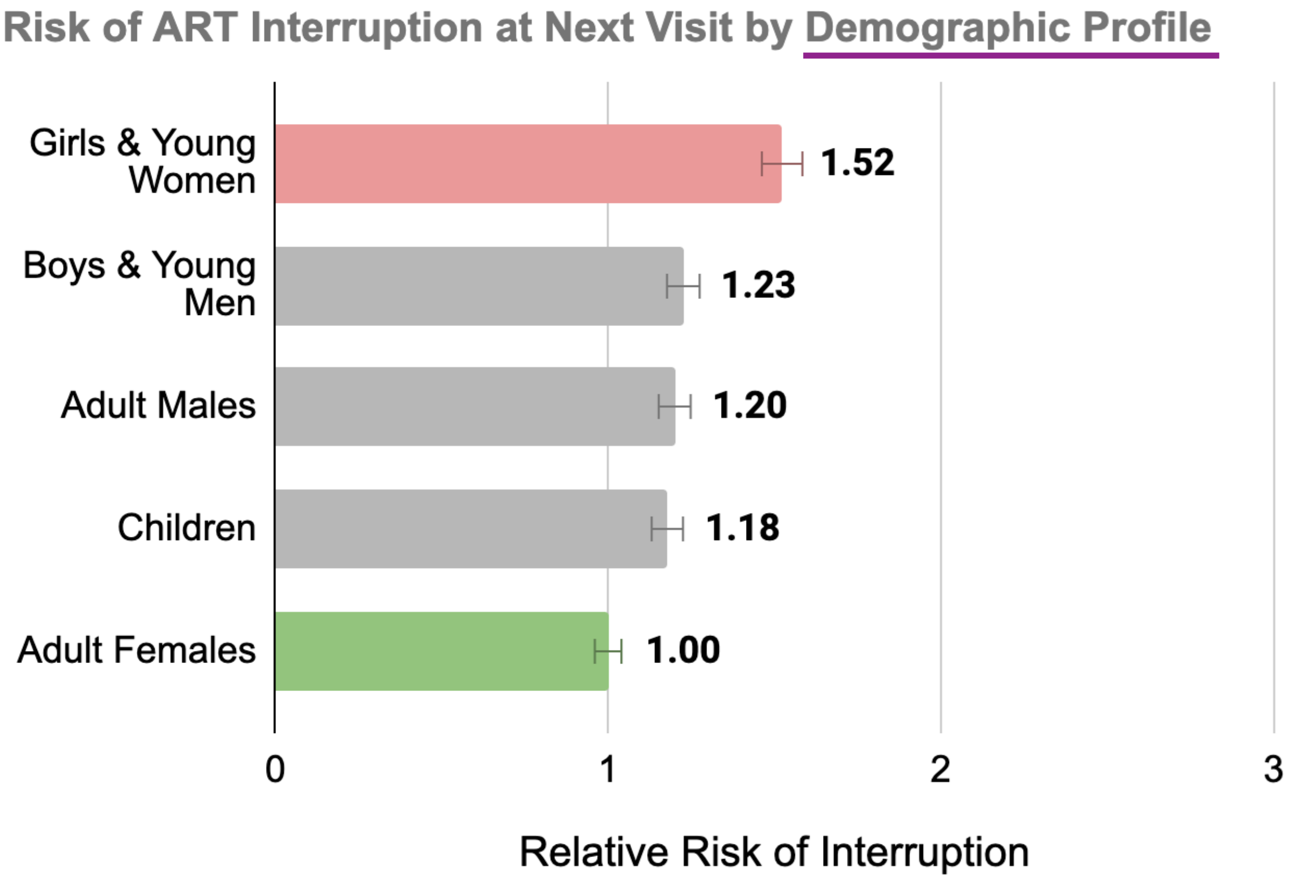



## High Viral Load Classifier



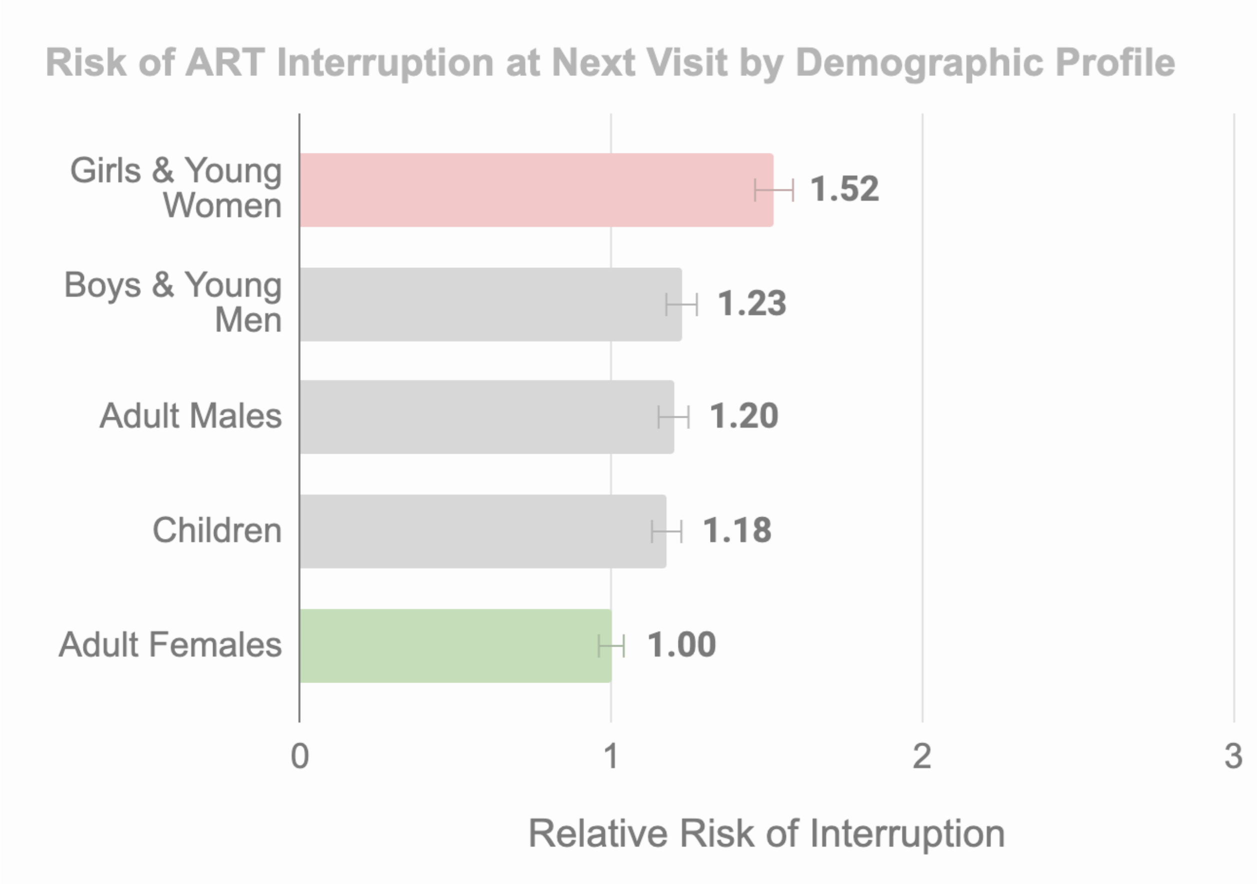

*[Maskew et al, 2022, https://www.nature.com/articles/s41598-022-16062-0]*

# **Results:** Traditional Demographics

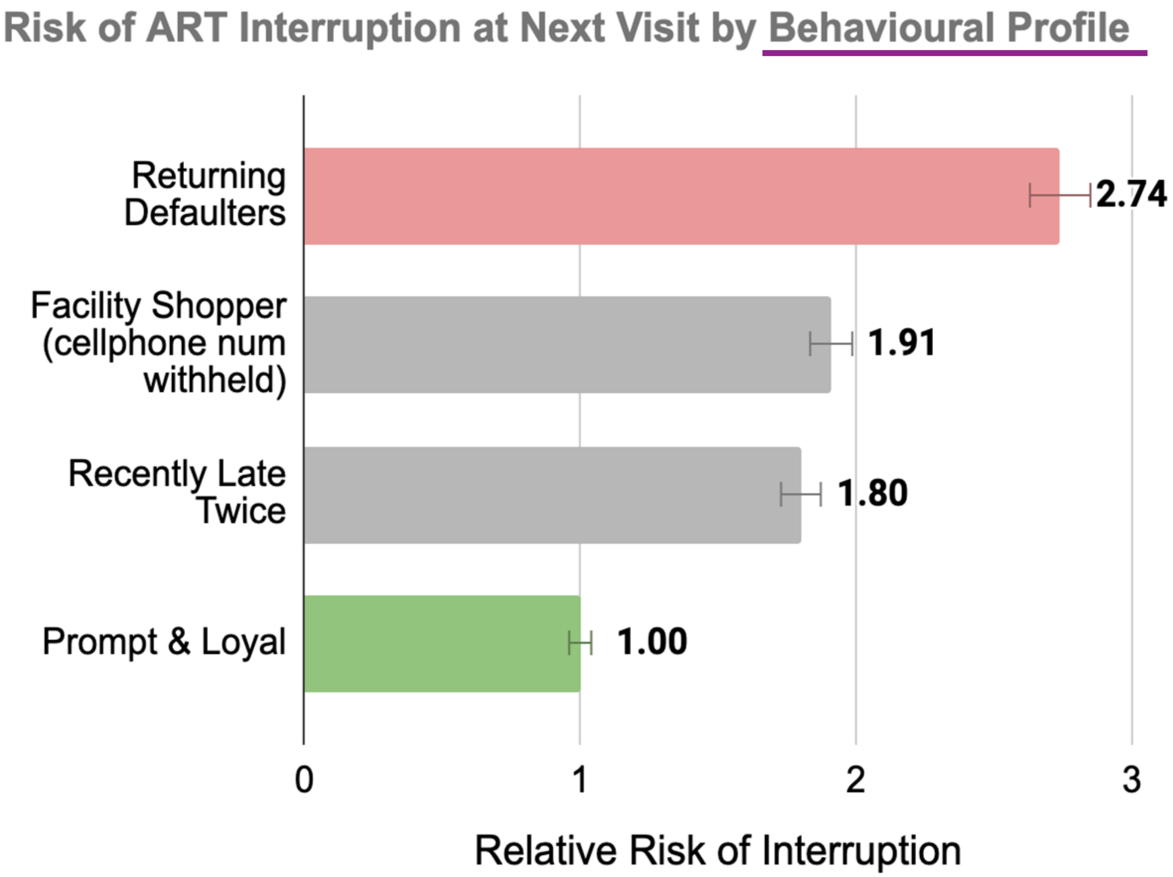



(n = 625,048 visits)

# **Results:** ML identified behaviours




(n = 625,048 visits)

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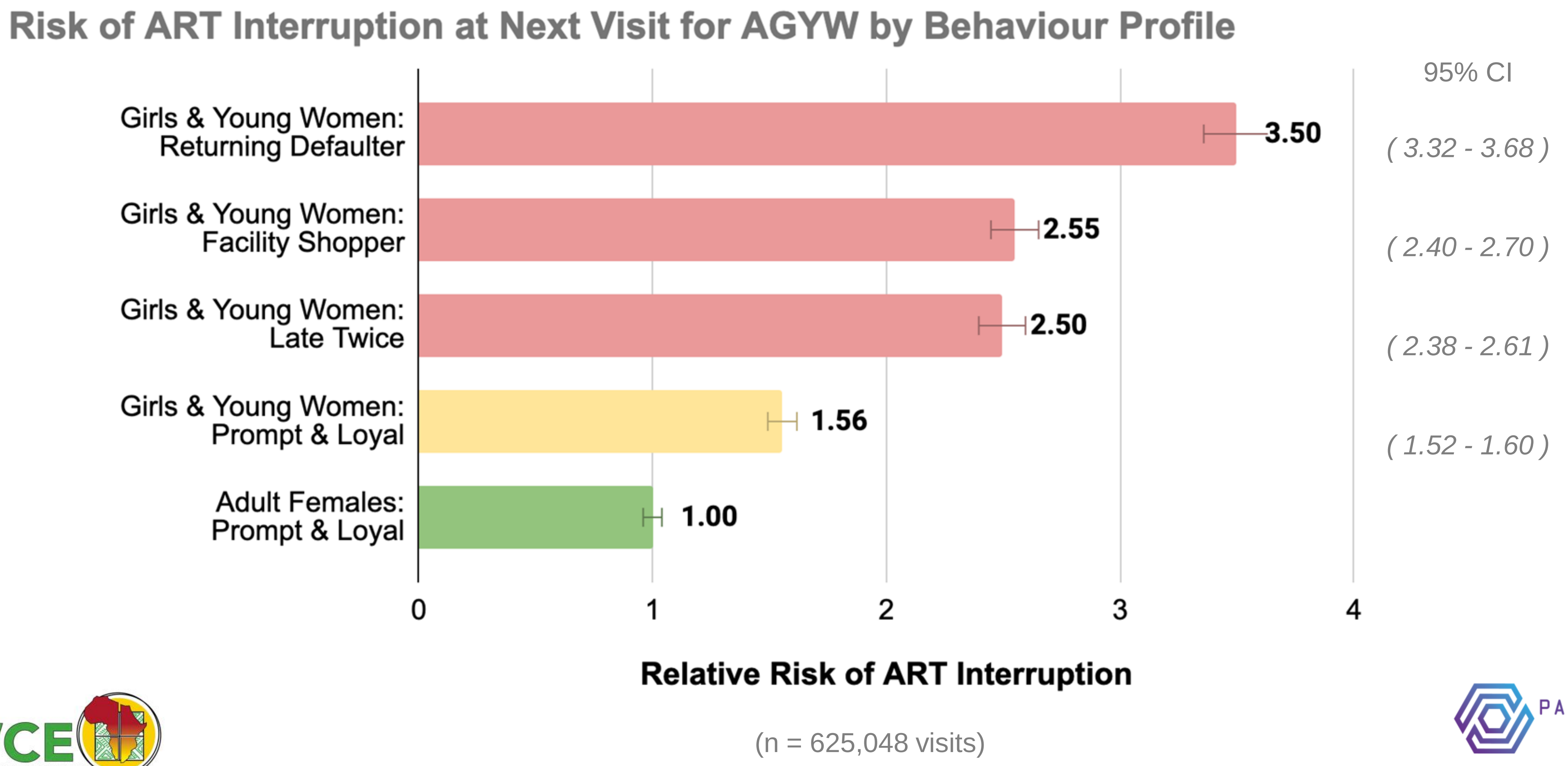
# **Results:** ML identified behaviours



**Heterogeneity**

**"all happy families are alike,**

**while each unhappy family is unhappy**

**in their own way"**

- from *Anna Karenina*

# **Results:** Replicated in South Africa & Nigeria

| Method works on different EMRs | Results replicate |
|---|---|
| • 2 Provinces in South Africa | Very similar signal across<br>• Geography<br>• Time (covid) |
| • 4 States in Nigeria | • more variance between states and localized predictors<br>• Behaviour always a important factor >> demographics |

# Methods & Results

*Applying machine learning and predictive modeling to retention and viral suppression in South African HIV treatment cohorts,* Nature Scientific Reports, 2022 [https://doi.org/10.1038/s41598-022-16062-0]

*Validation and improvement of a machine learning model to predict interruptions in antiretroviral treatment in South Africa,* JAIDS, [https://doi.org/10.1097/qai.0000000000003108]

*Historical visit attendance as predictor of treatment interruption in South African HIV patients: Relating linear risk factors to a validated machine learning model,* PLOS,

IMPLEMENTATION SCIENCE

**Predictive Analytics Using Machine Learning to Identify ART Clients at Health System Level at Greatest Risk of Treatment Interruption in Mozambique and Nigeria**

Stockman, Jeni MA[a]; Friedman, Jonathan MA[b]; Sundberg, Johnna BA[a]; Harris, Emily MA[c]; Bailey, Lauren ScM[c]

Author Information

*JAIDS Journal of Acquired Immune Deficiency Syndro*

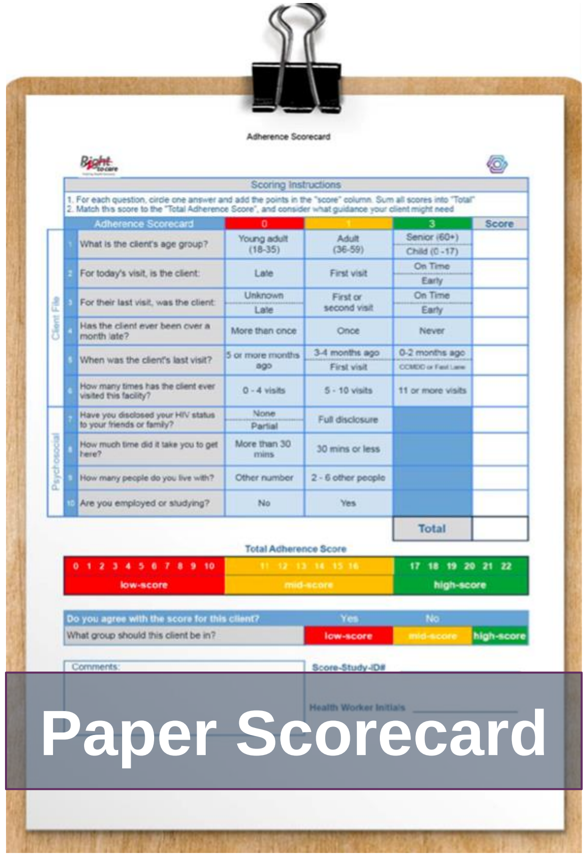
10.1097/QAI.0000000000002947

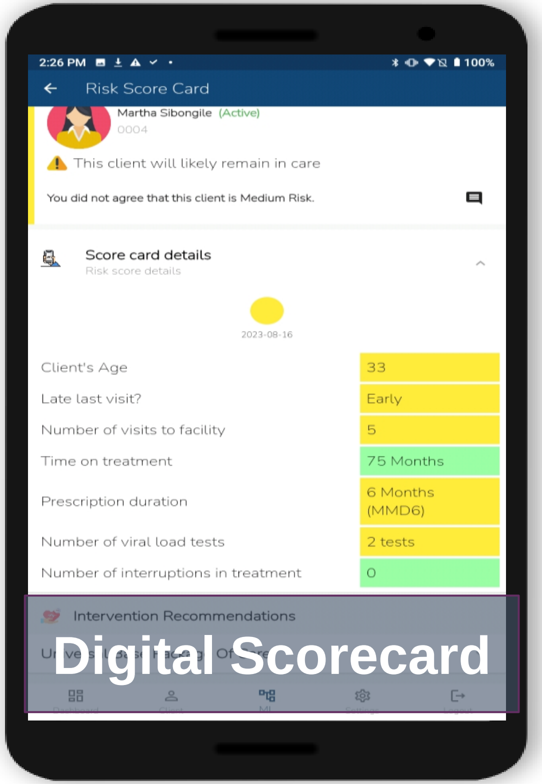
**Predicting Treatment Interruption Among People Living With HIV in Nigeria: Machine Learning Approach**

Ogbechie M, Fischer Walker C, Lee M et al.

***JMIR AI 2023***, *URL: https://ai.jmir.org/2023/1/e44432, DOI: 10.2196/44432*

# **Application:** Feasible point of care risk tool




- ✓ 98% Predictions Agreeable for Healthworkers
- ✓ Fast – bimodal consultations
- ✓ Observed training prediction distribution
- ? *Personalise interventions*
- ? *Improve Outcomes*

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# A good time to Embrace new methods

- Existing routine data
- Modern data science
- Non-linear Complexity

**Thank You!**