The relationship between lifecourse traumatic events (TE), HIV/AIDS and neurocognitive impairment (NCI) in older adults in rural South Africa

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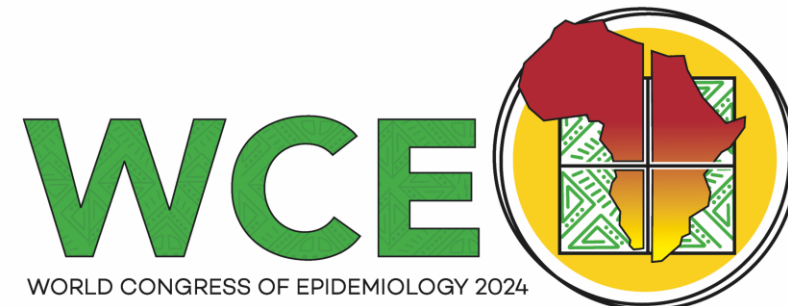
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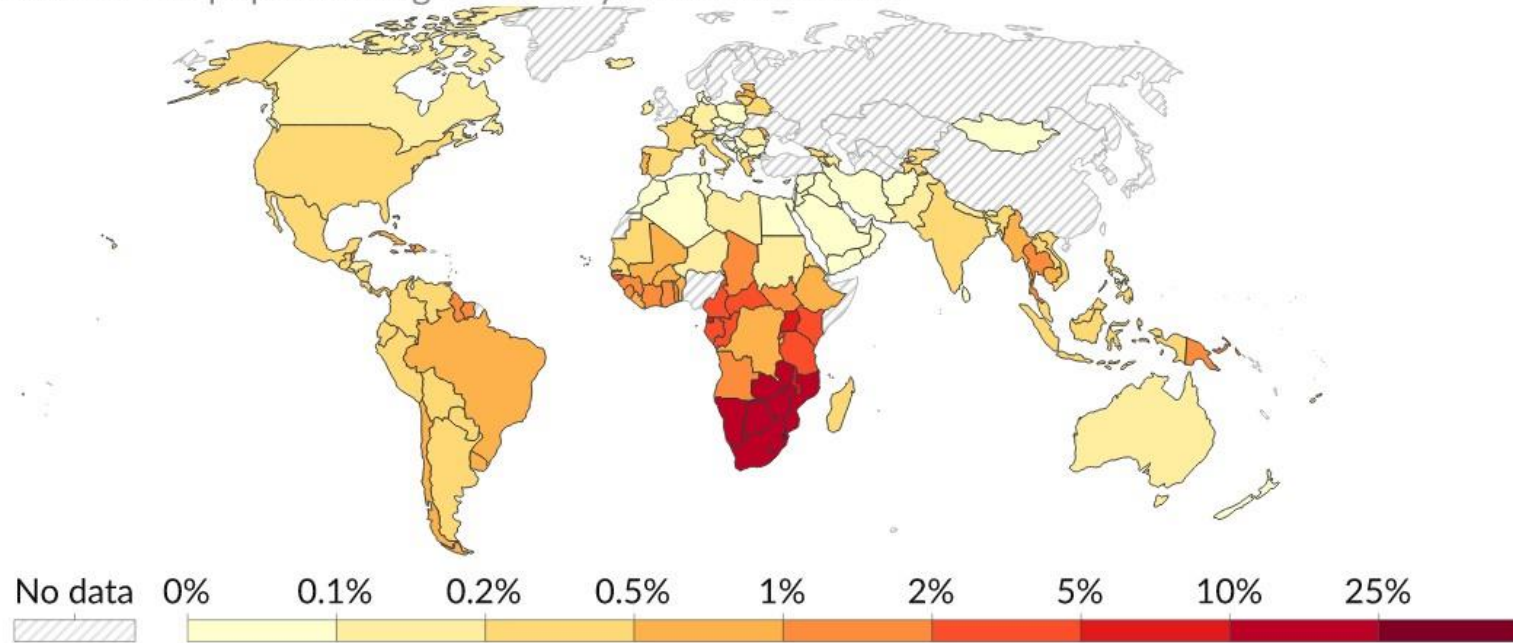Zvifadzo Matsena Zingoni

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HIV prevalence, 2022

The share of the population aged 15–49 years old with HIV.

No data   0%   0.1%   0.2%   0.5%   1%   2%   5%   10%   25%

**Data source:** UNAIDS (2023)

Background

- South Africa has the largest HIV epidemic in the world, with approximately 7.7 million People Living with HIV/AIDS (PLWHA).

- Since the roll-out of Highly Active Antiretroviral Therapy (HAART), PLWHA have been living longer and therefore require attention for a range of comorbid diseases.

- Comorbidities include Tuberculosis (TB), cryptococcal meningitis and neurocognitive impairment (NCI), impairment in cognitive domains measured by a comprehensive neuropsychological battery of tests including motor functioning, speed of information, executive functioning, working memory, learning, memory and verbal fluency

- South Africa has an epidemic of traumatic events (TE) including crime, violence and institutional violence. TE can be linked to NCI.

What is NCI in HIV ?
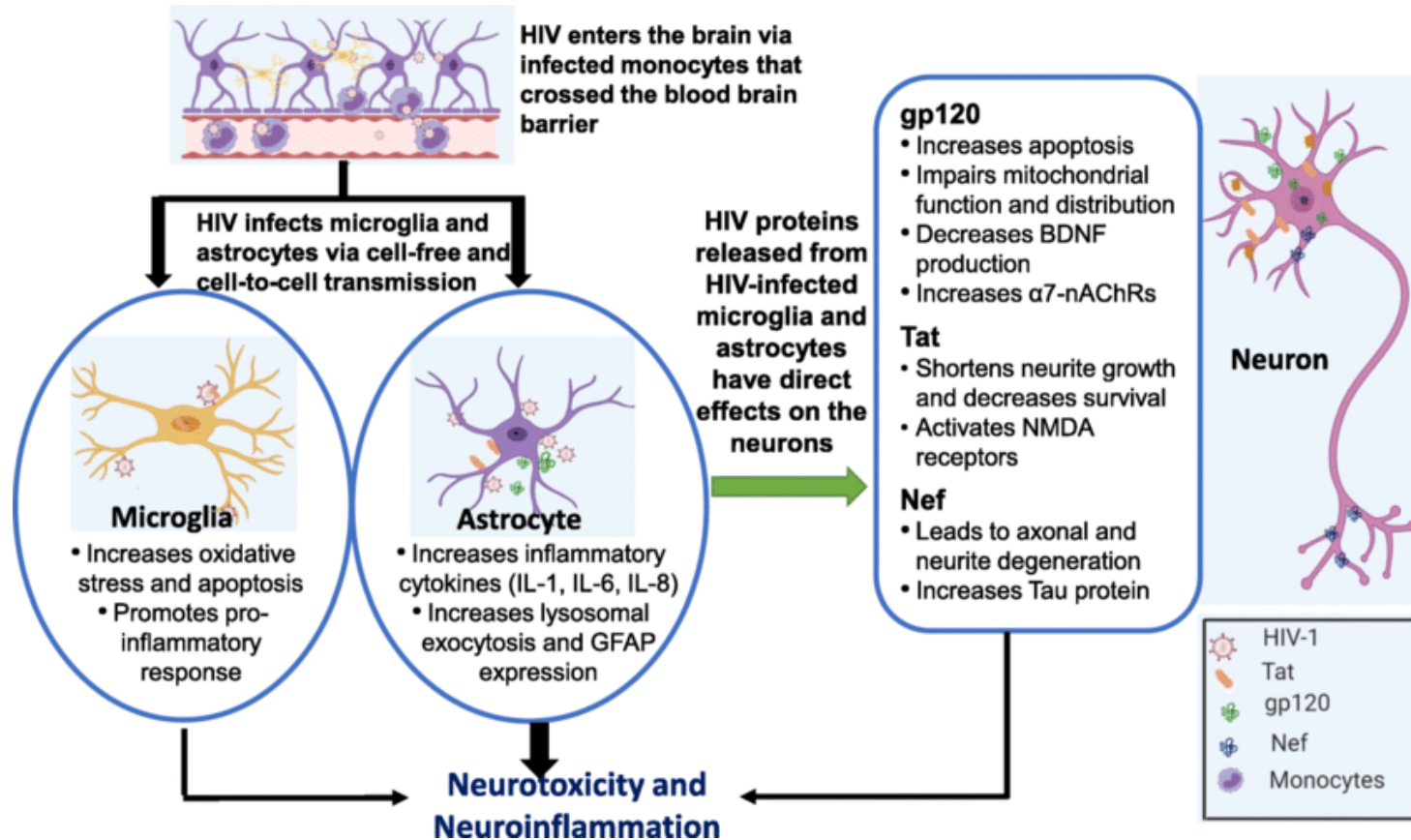
How do TE link to HIV and NCI?

- TE include sexual or physical assault as well as emotional abuse or neglect

- Data suggests that TE, particularly a 'dose response' relationship are associated with a range of pathologies including HIV

- Spies et al (2020) examined the relationship between potentially traumatic or stressful events, HIV infection and neurocognitive impairment (NCI):

Sensorimotor cortex
Function: Coordination of sensory and motor functions
In PTSD: Symptom provocation results in increased activation

Thalamus
Function: Sensory relay station
In PTSD: Decreased cerebral blood flow

Parahippocampal gyrus
Function: Important for memory encoding and retrieval
In PTSD: Show stronger connectivity with medial prefrontal cortex; decreases in volume

Anterior cingulate cortex
Function: Autonomic functions, cognition
In PTSD: Reduced volume, higher resting metabolic activity

Prefrontal cortex
Function:
- Emotional
- Regulation

In PTSD:
- Decreased gray and white matter density
- Decreased responsiveness to trauma and emotional stimulia

Orbitofrontal cortex:
Function: Executive function
In PTSD: Decreases in volume

Amygdala
Function:
- Conditioned fear
- Associative learning

In PTSD:
- Increased responsiveness to traumatic and emotional

Fear response
Function:
- Evolutionary survival

In PTSD:
- Stress sensitivity
- Generalization of fear response
- Impaired extinction

Hippocampus
Function:
- Conditioned fear
- Associative learning

In PTSD:
- Increased responsiveness to traumatic and emotional stimuli
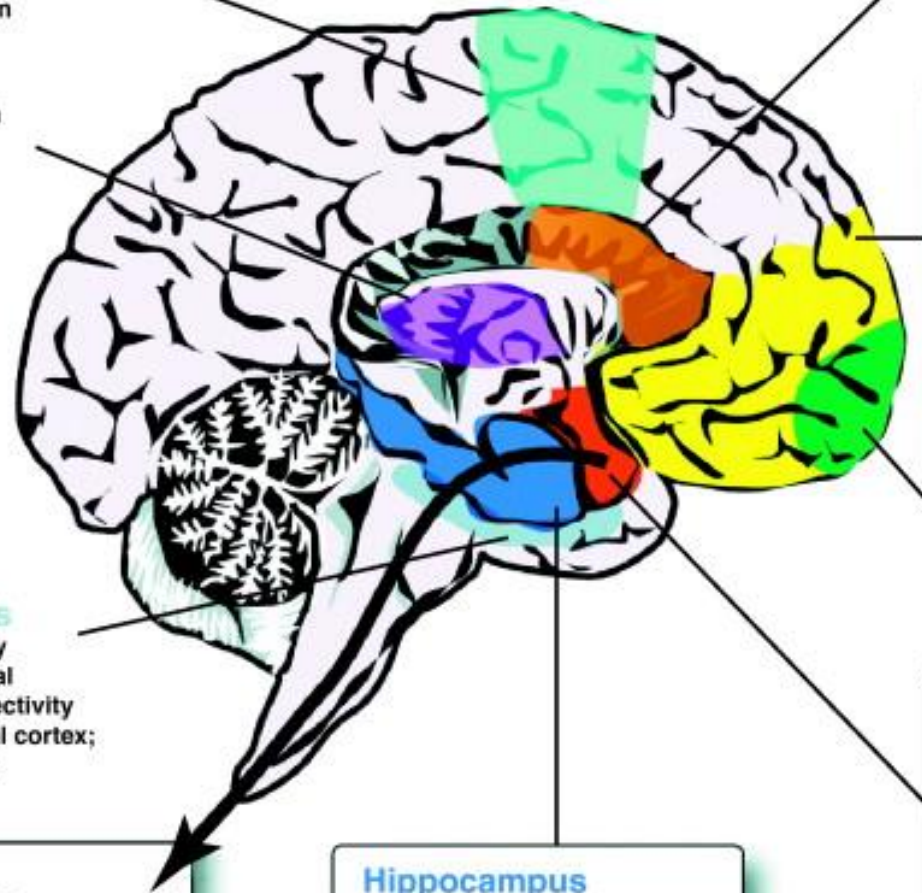
Aim

This study aimed to determine the combined (interaction) effect of life-course TE and HIV infection on the NCI of adult South Africans using the Health And Aging in Africa: A Longitudinal Study of an INDEPTH Community in South Africa (HAALSI) study

Methods

- HAALSI is a prospective study of adults age 40 and above recruited from the Agincourt sub district embedded within a Health and Demographic Site (HDSS)

- Currently consisting of 4 waves and 5059 participants and has collected data on a range of comorbidities including hypertension, strokes and NCI (measured by Oxford Cognitive Screen (OCS plus)

- Our analytical sample consists of those who have complete TE data measured by English Longitudinal Study of Aging

- A score≥1.5 standard deviations (SD) below the mean of the baseline cognitive function distribution on the cognitive assessment (managing to know the date, day, month and president) will mean no NCI while a score below the means some degree of NCI)

- NCI is analysed as a z-standardized latent variable capturing time orientation, episodic memory, and numeracy

1). Ever experiencing a natural disaster

2).Ever experiencing a life-threatening serious physical attack

3). Ever been the victim of sexual abuse

4).Ever been a victim of sexual abuse

5). Having parents unemployed for over 6 months

6). Ever experiencing parents fighting or arguing

7). Parents on substance abuse

8). Ever experience physical abuse by parents

9). Ever witnessed death in non-combat

10). Ever witnessed the death of relative or friend

11). Ever provided long-term care to disabled

12). Ever experienced severe financial hardship

Results

Socio-demographic characteristics of the sample:

- Median age of participants was 64, 53% of the sample were female, 44 percent with no formal education and 72.63% of the sample were unemployed, 69.40% were South African.

Health status of the sample:

- 41.28% of the sample were HIV positive, 37.79% were hypertensive and 0.67% had experienced a stroke

TE

- 58.74% had experienced financial hardship
- 39.73% had experienced natural disaster
- 23.30 had ever witnessed the death of a relative or friend

Results

Prevalence of NCI is 7%

Results

Characteristics	Categories	No NCI n %	NCI n %	*p*-value
Gender	Male	1527(92.10)	131(7.90)	0.724
	Females	2034(91.79)	182(8.21)	
Education	No formal education	1577(85.01)	278(14.90)	
	Some primary school (1-7 years)	1375(95.55)	64(4.45)	
		852(97.71)	20(2.29)	**<0.0001**
	Some secondary school(8+ years)			
Employment status	Employed (full or part-time)	676(97.97)	14(2.03)	**<0.0001**
	Not working	2712(89.42)	321(10.58)	
	Homemaker	415(93.89)	27(6.11)	
Age				
Mean (SD)	Mean: ±65.16;SD(12.59)	64.2 (12)	75.04 (14.1)	**<0.0001**
Median (IQR)	IQR): 64 (55;74)	64 (55-74)	64 (55-74)	**<0.0001**

Results

Characteristics	Categories	Univariate Analysis		Adjusted Analysis		Interaction model	
		OR(95%CI)	P-value	Adjusted OR (95%CI)	P-value	Adjusted OR (95%CI)	P-value
Gender	Male	1(base)		1(base)		1(base)	
	Females	1.04(0.82-1.31)	0.724	0.96(0.73-1.26)	0.799	0.96 (0.73-1.27)	0.815
Education	No formal education	1 (base)		1 (base)		1(base)	
	Some primary school (1-7 years)	0.26(0.19-0.35)	<0.0001	0.36 (0.25-0.52)	<0.0001	0.36 (0.25-0.52)	<0.0001
	Some secondary school(8+ years)	0.13 (0.08-0.21)	0.001	0.43(0.24-0.75)	0.003	0.41 (0.23-0.73)	<0.0001
Employment status	Employed (full or part-time)	1 (base)		1 (base)		1(base)	
	Not working	5.71 (3.32-9.82)	<0.0001	1.99 (1.06-3.74)	0.031	1.98 (1.05-3.72)	0.033
	Homemaker	3.14 (1.62-6.05)	0.001	1.19 (0.56-2.50)	0.645	1.14 (0.54-2.42)	0.715
Age		1.07 (1.06-1.08)	<0.0001	1.05 (1.04-1.07)	<0.0001	1.05 (1.04-1.15)	<0.0001
Household wealth index	Poorest	1 (base)		1 (base)		1(base)	
	Average	1.13 (0.90-1.41)	0.274	1.08 (0.82-1.43)	0.572	1.07 (0.81-1.41)	0.612
	Richest	0.90 (0.58-1.40)	0.660	0.96 (0.56-1.64)	0.903	0.95 (0.56-1.16)	0.860
Nationality of origin	RSA	1 (base)		1 (base)		1(base)	
	Mozambique	1.97 (1.58-2.45)	<0.0001	1.46 (1.09-1.95)	0.009	1.45 (1.08-1.93)	0.011
Marital Status	Unmarried	1 (base)		1 (base)		1(base)	
	Married	0.43 (0.34-0.54)	<0.0001	0.63 (0.47-0.84)	0.002	0.63 (0.47-0.84)	0.002
Hypertension	No	1 (base)		1 (base)		1(base)	
	Yes	1.12 (0.89-1.40)	0.322	0.86 (0.47-1.49)	0.331	0.86 (0.64-1.15)	0.325
HIV Status	Negative	1 (base)		1 (base)		1(base)	
	Positive	2.06 (1.65-2.57)	<0.0001	1.08 (0.82-1.42)	0.559	0.79 (0.533-1.17)	0.252
Stroke	No	1 (base)		1 (base)		1(base)	
	Yes	2.93 (1.18-7.27)	0.020	2.62 (0.72-0.84)	0.142	2.67 (0.72-9.85)	0.138
Composite trauma	No	1 (base)		1 (base)		1(base)	
	Yes	0.14 (0.11-0.17)	< 0.0001	0.14 (0.11-0.18)	<0.0001	0.10 (0.07-0.15)	<0.0001
HIV Status# Composite trauma	No					1(base)	
	Yes					1.78 (1.04-3.04)	0.034

Results

Before adjustment of relevant confounders, HIV-positive participants had the highest proportion of NCI (n=208, 12.06%) compared to HIV-negative participants, and this was statistically significant (p-value=<0.001).

Results

- After adjusting for potential confounders, the odds of having NCI decreased (AOR=0.36; 95%CI: 0.25-0.52) and among those who had some primary school (AOR=0.43; 95%CI: 0.24-0.75) (1-7 years) and some secondary school (8+ years), respectively compared to those with no education.

- The odds of having NCI increased by 99% (AOR=1.99; 95%CI: 1.06-3.74) among those who were not working compared to those who are employed.

Results

- After adjustment, a one-year increase in age was associated with an increase in the odds of having NCI (OR=1.05; 95%CI: 1.04-1.07).

- Mozambique nationals had an increased odds of 1.46 (95%CI: 1.09-1.95) of having NCI compared to SA nationals

- In the interaction model we found no association between stroke, hypertension and HIV

Discussion

- The high levels of little formal education and unemployment (44.42%) and 72.63% (respectively) are not surprising and are parallel to national South African estimates that have been reported over time

- Higher education was also said to have protective effects against NCI deficits as well as for the particular cognitive domains of executive functioning, learning, and information processing speed

- Those without composite trauma had reduced odds (AOR=0.10; 95%CI: 0.07-0.15) of having NCI compared to those who have composite trauma. This finding are in line with previous studies, which found that life-course events such as financial hardship, physical abuse, the death of a spouse or partner, and stress were all significantly associated with worse neurocognitive performance and functional decline

Conclusion

- TE screening is not standardized and can also be under – reported

- There is potential to extend beyond a cross-sectional analysis using later waves of HAALSI

- If TE continue to suggest relationships with NCI given the numerous confounders, TE intervention could inform part of treatment

- Study suggests lessons for the value of HDSS

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