Intimate Partner Violence and Malnutrition among Women of Reproductive Age in Western Africa: A Geostatistical Analysis

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A joint work with

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Intimate partner violence (IPV)

• Any behavior within an intimate relationship that leads to physical, mental, emotional or sexual injury to others in the relationship.

• It includes physical harassment, sexual coercion, psychological torture, and controlling behaviors.

• Most reported cases are perpetrated by men towards women.
Fig. 1: Prevalence of IPV among ever-married/partnered women aged 15–49 years in selected regions of the world.

Source: WHO, 2018
Fig. 2: Prevalence of lifetime IPV for some West African countries (physical, sexual or emotional)

Source: DHS data
Consequences of IPV in women

- Eating disorders, chronic fatigue and unhealthy weight loss
- Psychological stress which increases oxidative stress and metabolic levels.
- Abusive partners more likely withhold food from their victims, leaving them to starve
- Women experiencing IPV may be incapable of deciding for themselves, including inability to decide the choice, quantity and type of food that they eat

An implication: IPV and nutritional status can be highly correlated
Fig. 3: Prevalence of underweight among women aged 20-49 years by 2016

Source: UNICEF, 2023
Our aim

• Explore the relationship between IPV and undernutrition across smaller geographical settings in West African countries in a manner that considers the neighborhood structure of the settings

• Provide insight into the variations across different locations, aiding location-specific policies and interventions
Data Source

• Demographic and Health Survey

• 10 West African countries with data collected at different times between 2010 and 2020

• We considered IPV (physical, emotional or sexual violence)

• Underweight and thinness
# Table 1: Measuring IPV

<table>
<thead>
<tr>
<th>Physical violence</th>
<th>Sexual violence</th>
<th>Emotional violence</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pushing or shaking you or throwing something at you</td>
<td>• Physically forcing you to have sexual intercourse with him even when you did not want to</td>
<td>• Saying or doing something to humiliate you in front of others</td>
</tr>
<tr>
<td>• Slapping you</td>
<td>• Physically forcing you to perform any other sexual acts you did not want to</td>
<td>• Threaten to hurt or harm you or someone close to you</td>
</tr>
<tr>
<td>• Twisting your arm or pulling your hair</td>
<td>• Forcing you with threats or in any other way to perform sexual acts you did not want to</td>
<td>• Insulting you or making you feel bad about yourself</td>
</tr>
<tr>
<td>• Punching you with his fist or with something that could hurt you</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Kicking you, dragging you or beat you up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Threaten or attack you with a knife, gun, or any other weapon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Trying to choke you or burn you on purpose</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Measurement of undernutrition in adult women

Measured through body mass index (BMI)

\[ BMI = \frac{weight\ (kg)}{height\ (m^2)} \]

BMI < 18.5kg/m2 \rightarrow Underweight
BMI < 17.0 kg/m2 \rightarrow Thin
Geostatistical model

- Assuming $Y_1$ and $Y_2$ are binary indicators for IPV and undernutrition, respectively
- We considered a bi-probit spatial model
- $Y_1$ and $Y_2$ are considered to have been generated from some latent variables $Y_1^*$ and $Y_2^*$ such that

$$Y_1 = \begin{cases} 
1 & \text{if } Y_1^* > 0 \\
0 & \text{otherwise}
\end{cases}$$

and

$$Y_2 = \begin{cases} 
1 & \text{if } Y_2^* > 0 \\
0 & \text{otherwise}
\end{cases}$$
The model

- Bivariate normal for the latent variables
  \[
  \begin{bmatrix}
  Y_1^* \\ Y_2^*
  \end{bmatrix} | \nu \sim N\left(\begin{bmatrix}
  \mu_1 \\ \mu_2
  \end{bmatrix}, \begin{bmatrix}
  \sigma_1^2 & \rho \sigma_1 \sigma_2 \\
  \rho \sigma_1 \sigma_2 & \sigma_2^2
  \end{bmatrix}\right)
  \]

  \[\vartheta' = (\mu_1, \mu_2, \rho)\]

- Distributional regression framework
  \[\vartheta_k = h_k^{\vartheta_k} (\eta_i^{\vartheta_k})\]

  \[\eta_i^{\vartheta_k} = \alpha^{\vartheta_k} + \beta^{\vartheta_k} (v_i^m) + f_p^{\vartheta_k} (v_i^l) + u^{\vartheta_k} (s_i)\]
Bayesian inference

• Priors
  - Linear terms ($\alpha$ and $\beta$): diffuse prior
  - Nonlinear term ($f(v_i)$): Bayesian p(enalized) spline with 20 equidistance knots and a second-order random walk as hyperprior
  - Spatial term ($u(s_i)$): Gaussian Markov random field

• MCMC
  - Metropolis-Hastings algorithm based on iteratively weighted least square (IWLS)
  - 35,000 iterations, 5,000 burn-in sample and thinned every 30th observations for parameter estimation
The findings

Fig. 4: Spatial effects for (a) IPV, (b) underweight, and (c) correlation
Fig. 5: Spatial effects for (a) IPV, (b) thinness, and (c) correlation
Fig. 6: Spatial effects for (a) physical violence, (b) underweight, and (c) correlation
Fig. 7: Spatial effects for (a) emotional violence, (b) underweight, and (c) correlation
Fig. 8: Nonlinear effects of age (upper) and age gap (lower) for IPV and underweight
Fig. 9: Nonlinear effects of age (upper) and age gap (lower) for physical violence and underweight
<table>
<thead>
<tr>
<th>Variables</th>
<th>IPV</th>
<th>Underweight</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Crl</td>
<td>Mean</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>0.008</td>
<td>-0.029, 0.045</td>
<td>-0.058</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Primary</td>
<td>0.114</td>
<td>0.075, 0.153</td>
<td>-0.131</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.050</td>
<td>0.007, 0.093</td>
<td>-0.080</td>
</tr>
<tr>
<td>Higher</td>
<td>-0.249</td>
<td>-0.334, -0.161</td>
<td>-0.170</td>
</tr>
<tr>
<td>Wealth index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poorest</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Poorer</td>
<td>-0.021</td>
<td>-0.064, 0.022</td>
<td>-0.087</td>
</tr>
<tr>
<td>Middle</td>
<td>-0.024</td>
<td>-0.071, 0.021</td>
<td>-0.186</td>
</tr>
<tr>
<td>Richer</td>
<td>-0.082</td>
<td>-0.136, -0.035</td>
<td>-0.325</td>
</tr>
<tr>
<td>Richest</td>
<td>-0.248</td>
<td>-0.312, -0.182</td>
<td>-0.520</td>
</tr>
<tr>
<td>Employment</td>
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<td></td>
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<tr>
<td>Working</td>
<td>0.173</td>
<td>0.14, 0.208</td>
<td>-0.070</td>
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<tr>
<td>Media access</td>
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<tr>
<td>Newspaper</td>
<td>-0.044</td>
<td>-0.098, 0.012</td>
<td>-0.051</td>
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<tr>
<td>Radio</td>
<td>0.059</td>
<td>0.031, 0.092</td>
<td>-0.037</td>
</tr>
<tr>
<td>Television</td>
<td>0.024</td>
<td>-0.013, 0.063</td>
<td>-0.050</td>
</tr>
</tbody>
</table>

Table 2: Posterior estimate for the linear effects for IPV and underweight
Conclusion

• Strong spatial clustering of IPV and the underweight indicators exist within and across the West African countries.

• Strong clustering of IPV in Liberia, Sierra Leone, parts of Mali, Central and Southern Nigeria spanning through southern Cameroon

• Underweight is clustered in northern Nigeria extending to northern Cameroon and throughout Burkina Faso.
Conclusion

• There is a positive linear relationship between IPV and underweight among women of most parts of Mali, Sierra Leone and Liberia extending to neighbouring Cote d’Ivoire, Ghana, and Togo

• With rising age, the relationship between IPV and underweight becomes positive
Thank you

Merci