Uruguayan Women’s Breast Cancer Knowledge: Using Novel Modeling Techniques

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Breast Cancer in Uruguay

- Highest breast cancer mortality rate in Latin America and continues to increase over time (Ferlay et al., 2010; WHO, 2012)
Breast Cancer Knowledge in Uruguay

• Overall, research in this area is sparse

• In the U.S., women who have more breast cancer knowledge are more likely to:
  • Be younger (Jimenez et al., 2011)
  • Have children (Bird et al., 2010)
  • Have higher levels of formal education (Ramirez et al., 2000)
  • Obtain mammography screenings (Harris et al., 2003)

• Communities shape women’s breast cancer knowledge levels by hosting educational programs, providing access to information, and influencing the quality of resources available (Bigby, 2007)
Health Literacy

Cultural & Conceptual Knowledge

Oral Literacy

Print Literacy

Numeracy

(IOM, 2002)
Cultural and Conceptual Knowledge

Cultural and conceptual knowledge represents the filter through which individuals obtain, process and understand health information and options for diagnosis and treatment (IOM, 2002).

(Buki & Quintero Johnson, 2009)
Aim of the Study

Examine the psychometric properties of the breast cancer knowledge subscale and explain the influence of individual level variables (mammography screening status, age, education level, area of residence) on participant characteristics and item responses.
Sample

- Recruitment and data collection were done in collaboration with the Comisión Honoraria de Lucha Contra el Cáncer

- National sample of 410 women ages 40-65 years was obtained from 5 departments: Artigas, Flores, Maldonado, Montevideo, and Treinta y Tres

- Approximately half of participants were up to date for mammography screening (2 years)

<table>
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<th>Mean</th>
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<tbody>
<tr>
<td>Age</td>
<td>51 years</td>
<td>-</td>
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<tr>
<td>Education level</td>
<td>10.43 years</td>
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<td>Have Children</td>
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Explanatory Item Response Modeling (EIRM)

• Within the Item Response Theory (IRT) family
• Innovative measurement approach using generalized linear and non-linear mixed models (De Boeck & Wilson, 2004)
• Models how properties of items and participant characteristics influence item responses
  • Provides information about participants to help determine differences in knowledge levels
• Appropriate method for handling measurement error and dependency within data
  • Protects against inflating standard error
Within the Uruguayan version of the Cancer Health Literacy Measure – Breast and Cervical Cancer (Buki & Reich, 2012):

- 12 items
- Sample item: “Younger women have a higher risk of getting breast cancer than older women.”
- Response format of “yes,” “no,” and “I don’t know”
- “I don’t know” responses collapsed into “no” responses for the analyses
- Alpha and Kuder-Richardson coefficients of reliability:
  - \( \alpha = .61 \)
  - \( KR - 20 = .62 \)

Breast Cancer Knowledge Subscale

- Residency \( x_3 \)
- Education \( x_4 \)
- Having Children \( x_5 \)
- Age \( x_1 \)
- Mammography status \( x_2 \)

BC Knowledge

\[ Y_1, Y_2, Y_3, Y_4, Y_5, Y_6, Y_7, Y_8, Y_9, Y_{10}, Y_{11}, Y_{12} \]
Results

- A 2PL EIRM was fit to the data using SAS 9.3 PROC NLMIXED (SAS Institute, 2011)
  \[-2 \text{Log Likelihood} = 27551, \ AIC = 27593, \ BIC = 27725\]
  - Likelihood ratio test indicated the model is significantly different, \(p < .0001\)
  - Items 2, 7, 10, and 12 were dropped which improved item fit
  - Women who were up to date for a mammogram, had children, and were from Flores and Artigas were more likely to have higher BC knowledge levels, \(p < .0001\)
  - Women from Maldonado were more likely to have lower levels of BC knowledge, \(p < .0001\)

\[
\begin{align*}
\text{Mammography status} & \times 4 \quad (\text{OR} = 2.364) \\
\text{Having Children} & \times 2 \quad (\text{OR} = 1.978) \\
\text{Maldonado} & \times 1 \quad (\text{OR} = .794) \\
\text{Artigas} & \times 5 \quad (\text{OR} = 1.612) \\
\text{Flores} & \times 3 \quad (\text{OR} = 1.612)
\end{align*}
\]

\[\text{BC Knowledge} = \theta\]

\(\rightarrow\) decrease in BC knowledge
Conclusion

• Having children, mammography status, and women’s residency, explained breast cancer knowledge item responses
• Demonstrate utility of EIRM for health literacy measurement development
• Provide information on screening barriers and facilitators within a universal healthcare system

Implications and Future Directions

• Develop educational interventions to increase BC knowledge targeting women (40-65 years) who have not obtained a mammogram screening within 2 years, do not have children, and reside in Maldonado
References


## Final Model Parameter Estimates

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