HOW MUCH VALUE DOES CASCADE TESTING OF FIRST-DEGREE RELATIVES ADD TO POPULATION SCREENING FOR HEREDITARY BREAST AND OVARIAN CANCER?

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INTRO

- Previous economic analyses of population screening for hereditary breast and ovarian cancer (HBOC) have not considered cascade testing, wherein newly identified carriers spur family members to undergo genetic testing.
- We developed an approach to model cascade testing based on results of a standalone population HBOC screening model[1] and estimated the impact of combining their incremental results.

METHODS

- We used the standalone population screening model (Figure 1) to estimate age-based incremental costs and QALYs for newly identified HBOC carriers, then calculated dynamic weighted averages of incremental outcomes for carriers' surviving female relatives in the cascade testing model.
- We used a decision tree approach to model key elements of cascade testing (Figure 2).
- We used data on living female relatives from the Panel Study of Income Dynamics (PSID; Figure 3)[2] and derived other model parameters from a literature review of family communication studies.[3,4]
- We then combined results to derive overall population screening plus cascade testing costs and outcomes (Figure 4).

Figure 1. Primary Population Screening Model[1]

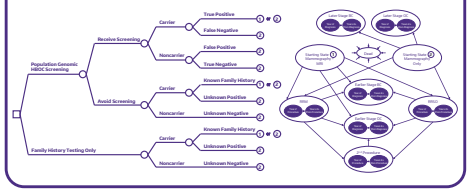


Figure 2. Cascade Testing Decision Tree

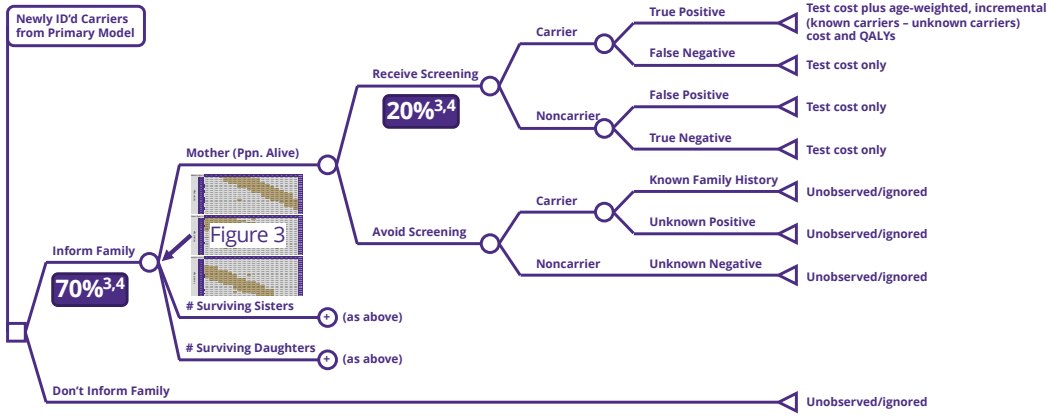


Figure 3. PSID[2] Tables: Living Female Relatives by Age

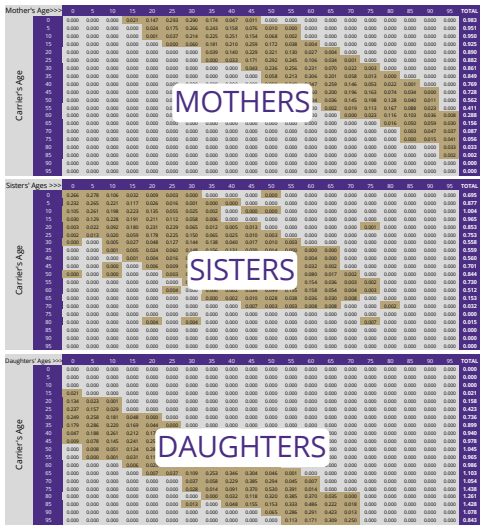
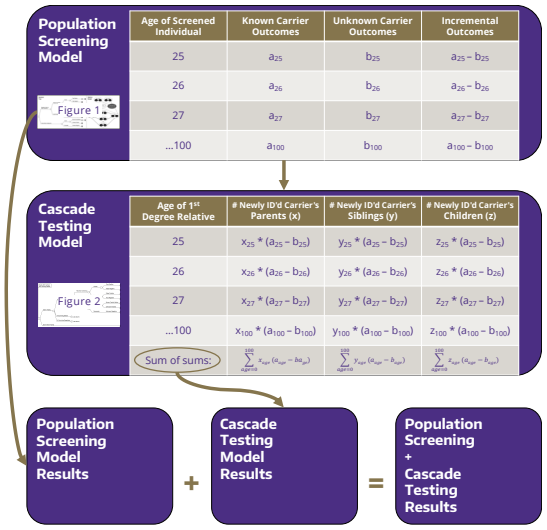


Figure 4. Cascade Testing Model Calculation Algorithm



RESULTS

Table 1. Model Results: No Cascade Testing vs. Cascade Testing

		Total Cancer Cases/100K	Cost/ Woman Screened	QALYs/ Woman Screened	ICER
Screened at 30 Years Old					
Population Screening		13,786	$14,400	25.7990	
Family History-Based Testing		13,853	$14,200	25.7964	
Incre-mental	No Cascade Testing	-67	$240	0.0026	$92,600
	With Cascade Testing	-8	$9	0.0003	$87,700
Screened at 45 Years Old					
Population Screening		12,930	$18,500	21.7245	
Family History-Based Testing		12,947	$18,300	21.7238	
Incre-mental	No Cascade Testing	-16	$250	0.0007	$354,500
	With Cascade Testing	-8	$10	0.0003	$268,200

CONCLUSIONS

- We found that the incremental impacts of cascade testing were modest.
- This finding was influenced primarily by the small number of identified carriers relative to noncarriers, the proportion of carriers who go on to tell their family members (70%), and the proportion of informed family members who go on to receive testing (20%).[3,4]
- Nonetheless, cascade testing should be implemented where feasible, and efforts should be made to improve rates of family communication and follow-up testing, as higher uptake of cascade testing should augment the overall value of population genomic screening.

REFERENCES

1. Guzauskas GF, Spencer S, Veenstra DL. Do Decision Tree-Based Models of Hereditary Breast and Ovarian Cancer (HBOC) Screening Create a Time Crunch? Presented at the 41st Annual Meeting of the Society for Medical Decision Making; 2019; Portland, OR.
2. Panel Study of Income Dynamics. Public use dataset. In: Produced and distributed by the Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI; 2019.
3. Elrick A, et al. J Genet Couns. 2017;26(1):173-181.
4. Roberts MC, et al. Health Aff (Millwood). 2018;37(5):801-808.