

## GLOBAL ECONOMIC EVALUATION OF POPULATION-BASED *BRCA1/BRCA2* MUTATION TESTING

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## ABSTRACT

### Objectives:

To evaluate cost-effectiveness and population-impact of unselected population-based *BRCA*-testing compared to clinical-criteria/family-history(FH) based *BRCA*-testing across Lower-middle-income/LMIC (India), Upper-middle-income/UMIC (Brazil/China) and High-income-countries/HIC (US/UK/Netherlands) health-systems.

### Methods:

Markov-modelling compared lifetime costs-&-effects of *BRCA1/BRCA2*-testing all general-population women  $\geq 30$ years compared with clinical-criteria/FH-based testing. Analyses undertaken for UK/USA/Netherlands/China/Brazil/India using both health-system/payer and societal perspectives. All women  $\geq 30$ years in the Population-Testing arm and only those fulfilling clinical/FH-criteria in the Clinical-Criteria/FH-based testing arm undergo *BRCA*-mutation testing. We collected primary-data on direct medical costs from China, Brazil, India. Costing-data were obtained from published NHS-reference-costs for the UK/Netherlands and published literature for USA. Future costs/health-effects discount-rate=3.5%. Parameter-uncertainty was explored using one-way and probabilistic-sensitivity-analyses. Specific health-economic cost-effectiveness threshold guidelines were used where available for UK=£20,000-£30,000; USA=\$50,000-\$100,000; Netherlands=€20,000-€50,000. Main-outcome=ICER/QALY. For comparison local currency values are converted to \$s using purchasing-power-parity factor.

### Results:

From 'societal-perspective', population-based *BRCA*-testing is 'cost-saving' in HIC: UK-ICER=\$-3,508/QALY; USA-ICER=\$-1,327/QALY; Netherlands-ICER=\$-8,663/QALY. It is potentially Cost-effective in UMIC depending on willingness-to-pay thresholds chosen and genetic-testing costs. UMIC-ICERs are just above 1\*GDP-threshold: China-ICER=\$20,988/QALY; Brazil-ICER=\$15,587/QALY. It becomes under 3\*GDP threshold in India if *BRCA*-testing cost is \$148/test (ICER=\$19,676/QALY). From 'payer-perspective', population-based *BRCA*-testing is cost-effective in HIC: UK-ICER=\$24,101/QALY; USA-ICER=\$19,804/QALY; Netherlands-ICER=\$28,668/QALY. Results are sensitive to genetic-testing costs. Population-based *BRCA*-testing can prevent an additional 2319-to-2666 breast-cancers and 327-to-449 ovarian-cancers/million-women translating to tens-of-thousands more breast/ovarian-cancers prevented across the population.

### Conclusions:

Population-based *BRCA*-testing is cost-effective in HIC and potentially in UMIC depending on the local willingness-to-pay thresholds. Genetic-testing costs need to fall further for LMIC cost-effectiveness. Population-testing can prevent tens-of-thousands more breast/ovarian-cancers than the current clinical strategy.