Cost-effectiveness of Community Health Campaign Strategies to Deliver Self-Collected Human Papillomavirus-Based Testing for Cervical Cancer Screening in Kenya

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Background and Objective

- In sub-Saharan Africa, cervical cancer(CC) screening coverage is low, leading to high CC-mortality burden in the region.
- Using community health campaigns may improve CC screening delivery when paired with access to treatment options.
- While HPV-based self-sampling is known to be a cost-effective screening approach, options for linkage to treatment for HPV-positive women have not been similarly evaluated.
- **Objective:** To assess the population health impact and incremental cost-effectiveness of the four following screening strategies using community health campaigns (CHC) for self-collected HPV testing:

CHC followed by VIA to assess appropriateness of cryotherapy **"HPV and Treat"**	CHC followed by VIA screening for triage **"HPV + VIA and treat"**

1	Standard linkage to treatment	2	Enhanced linkage to treatment	3	Standard linkage to treatment	4	Enhanced linkage to treatment
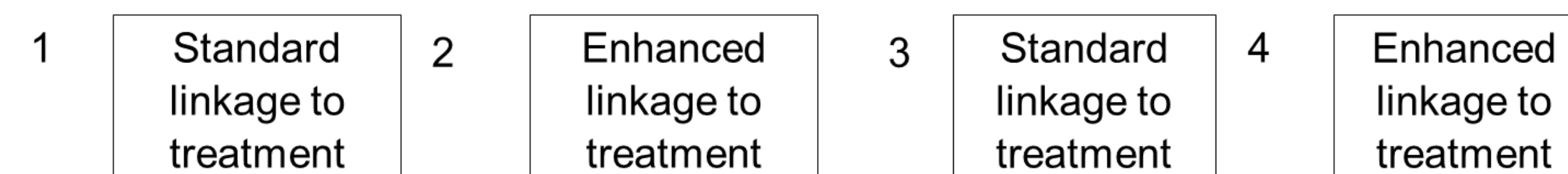
Methods

- Screening delivery scenarios and cost data were collected from a two-phase clustered-randomized trial conducted to compare HPV-based CC screening via CHCs using alternative methods for linkage to treatment in Migori County, Kenya
- We created a decision tree to estimate disability-adjusted life years (DALYs), costs, and cost-effectiveness (cost per DALY averted) for each screening scenario, over a 6-year time horizon for women aged 25-64 years from a societal perspective.
- Programmatic assumptions and screening strategies for the decision tree model were based on the health care delivery models implemented in the trial:
  - **Standard linkage to treatment** included using text messages, phone calls, and home visits conducted by community health volunteers.
  - **Enhanced linkage to treatment** included reminder text messages with updated messaging only sent to women who did not appear for treatment within 3 months after receiving their test results and holding CHCs in locations within close proximity to clinics where treatment is available (decentralization of treatment center).
- We compared the "HPV & Treat" strategy implemented in the trial to an alternative form of treatment triage recommended by Kenyan Ministry of Health– "HPV+VIA & treat".
- We used published literature to estimate test performance, and short- and long-term clinical outcomes, including disability weights due to screening for the first time in a LMIC setting.
- Costs were presented in 2018 International Dollar(I$).
- Cost-effectiveness was defined as three-times the national gross domestic product of Kenya in 2018 I$.

Results

Table 1: Base case cost-effectiveness results of 4 strategies for cervical cancer screening delivery models using community health campaigns in Kenya (6-year time horizon and 1000 women)

Screening Strategy	Total Costs (Int. $)	DALYs incurred	▲Cost (Int. $)	DALYs averted	ICER (Int. $ per DALY averted)
No Screening	$2,077	118.91			
HPV + VIA & Treat; Standard linkage*	$34,602	117.76	$32,521	1.16	$28,131
HPV & Treat; Standard linkage*	$35,798	113.60	$1,195	4.16	$287
HPV + VIA & Treat; Enhanced linkage	$62,689	112.69	$26,891	0.91	$29,593
HPV & Treat; Enhanced linkage	$70,752	106.41	$8,063	6.28	$1,284
Using extended dominance‡:					
No Screening	$2,077	118.91			
HPV & Treat; Standard linkage	$35,798	113.60	$33,721	5.32	$6,343
HPV & Treat, Enhanced linkage	$70,752	106.41	$34,955	7.19	$4,864
No Screening	$2,077	118.91			
HPV & Treat, Enhanced linkage	**$70,752**	**106.41**	**$68,676**	**12.50**	**$5,493**

‡Defined as the set of all possible mixed strategies that dominates a single strategy in both higher effectiveness and less cost

Figure 1: Tornado Charts Summarizing One-Way Sensitivity Analyses of Decision Tree Inputs: Factors included are the decision tree inputs that impacted the base case values of each model scenario the greatest
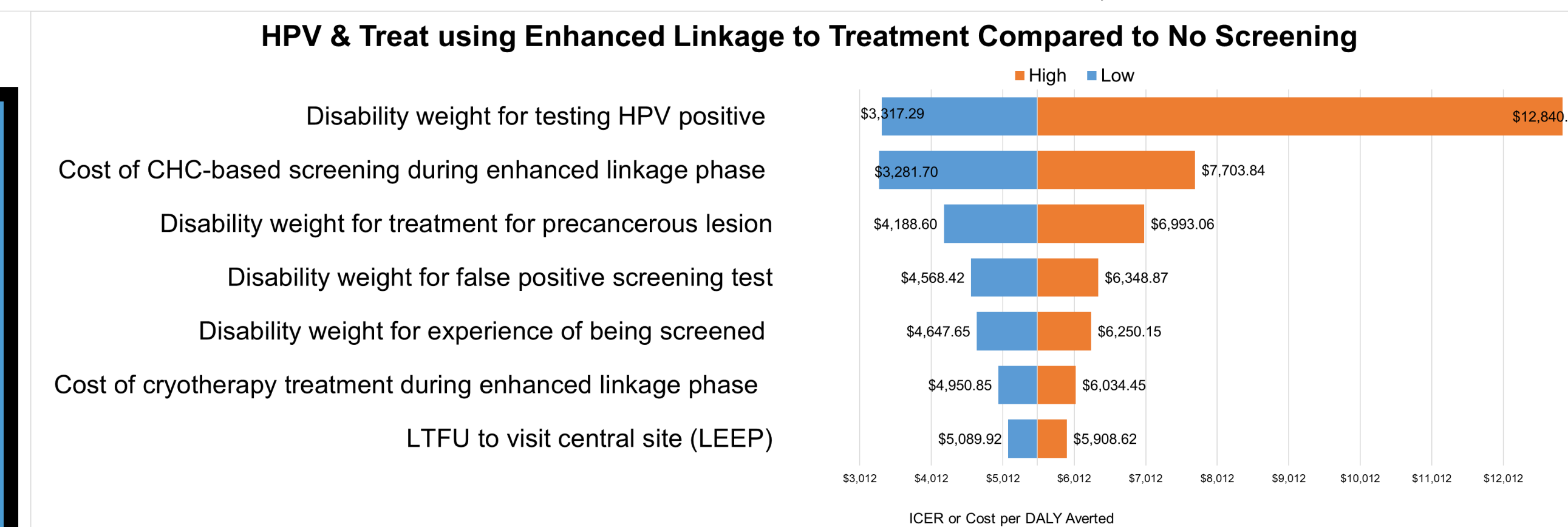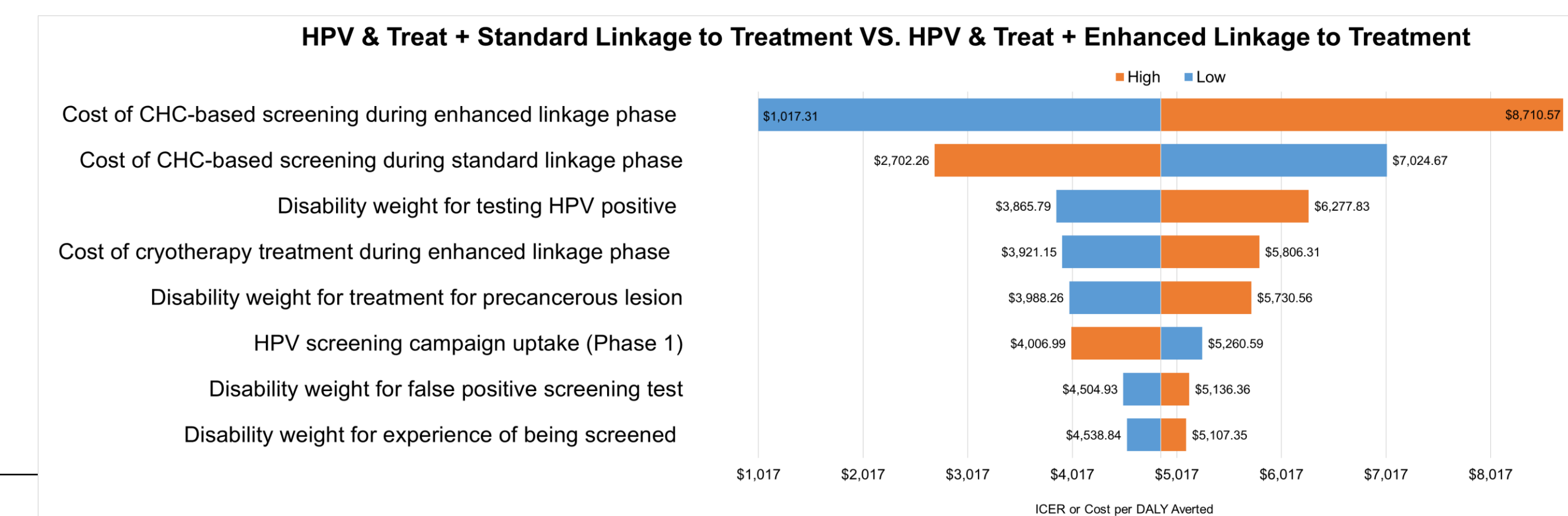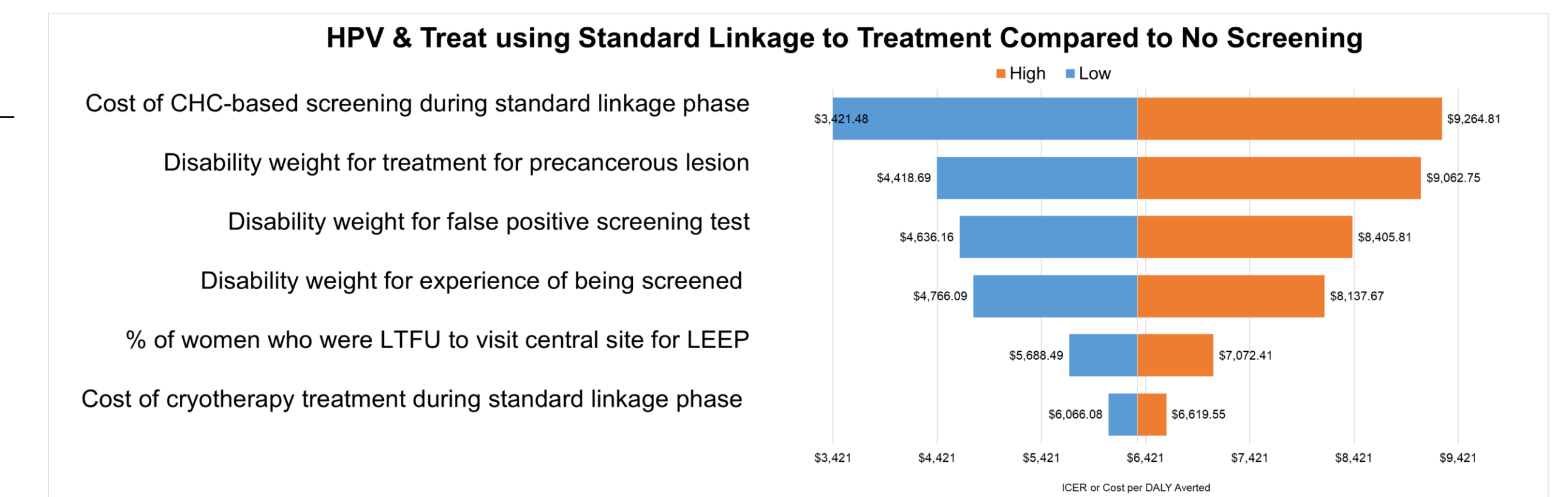
- The model was most sensitive to the following inputs:
  - Changes in disability weights for all three screening-related health states.
  - Range of costs of CHC-based screening using each linkage approach.

Utilizing "HPV & Treat" as a strategy to recommend women for treatment led to better health outcomes and was more cost-effective, compared to "HPV+VIA & Treat" due to fewer missed cases of CIN2+ eligible for treatment.

Compared to no screening, "HPV & Treat" with enhanced linkage to treatment was the most cost-effective option.

Conclusions

- Utilizing "HPV & Treat" as a strategy led to better health outcomes and was more cost-effective, compared to "HPV+VIA & Treat" due to fewer missed cases of CIN2+ eligible for treatment.
- Compared to no screening, HPV& Treat with enhanced linkage to treatment was the most cost-effective option at $5492.62 I$/DALY averted.
- Including potential DALYs incurred due to screening highly affected the cost-effectiveness of cervical cancer screening scenarios modeled.