The Institute for Clinical and Economic Review's Incorrect Use of Incremental Cost-Effectiveness Ratios

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Introduction/Objectives

Incremental Cost-Effectiveness Ratios (ICERs) are used to assess cost-effectiveness but their calculation must be appropriate. We reviewed the Institute for Clinical and Economic Review organization's (ICERO) 2022 report on obesity treatments. It evaluated semaglutide (SEM), liraglutide (LIR), phentermine/topiramate (P/T), and bupropion/naltrexone (B/N) - each added to lifestyle modification - and lifestyle alone (LS). Based on ICERO's ICERs, P/T was cost-effective; B/N "was cost-effective at higher thresholds." ICERO also calculated the price reduction it claimed necessary to make SEM cost-effective based on reducing its ICER to a conventional threshold willingness-to-pay (WTP=$150K/QALY).

Methods

Without justification, ICERO calculated ICERs vs. a common alternative (LS, Figure1). In contrast, a systematic process has been settled in the evaluation literature for many years, specifically rejecting any approach that uses a common alternative as potentially misleading.[1,2] We employed this time-tested approach and contrasted the two results.

ICERO also suggested a price reduction to make SEM cost-effective (29%). This set price so that SEM total costs made its ICER equal to the WTP. We employed the same approach, using total drug (D_S), **$285,800**, plus nondrug (ND_S), $106,200) costs. We then estimated the D_S reduction needed (holding ND_S constant) and compared it to ICERO's estimate. ICERO used the $\mathbf{ICER_{SEM,LS}}$. That ICER is not the appropriate

Methods (cont.)

target as it is irrelevant to cost-effectiveness.. Table 1 values were used to calculate the reduced SEM total cost,; the ICER is set to the WTP value of $150,000:

$$\mathbf{ICER_{S/LS}} = (C_S - \mathbf{C_{LS}}) / (E_S - \mathbf{E_{LS}}) = \text{WTP} = \$150\text{K}$$

$$(1) \quad [D_S + ND_S] = C_S = (E_S - \mathbf{E_{LS}}) * \text{WTP} + \mathbf{C_{LS}}$$

Figure 1 shows the $\mathbf{ICER_{S/LS}}$ (dotted line connecting SEM and LS) is not relevant to the cost-effectiveness question (relevant ICERs are solid lines). The ICER to be equal to the WTP is

$$\mathbf{ICER_{S/P/T}} = (C_S - \mathbf{C_{P/T}}) / (E_S - \mathbf{E_{P/T}}) = \text{WTP} = \$150\text{K}$$

$$(2) \quad [D_S + ND_S] = C_S = (E_S - \mathbf{E_{P/T}}) * \text{WTP} + \mathbf{C_{P/T}}$$

Results

We confirm ICERO's conclusion – P/T is cost-effective. Importantly, its claim that B/N would be cost-effective at a higher WTP, is incorrect as B/N is dominated and cannot be cost-effective. ICERO's required SEM price reduction was 29%; our use of a similar method, showed a required *total drug cost* reduction (27.2%):

$$C_S = (17.83 - \mathbf{16.93}) * 150{,}000 + \mathbf{179{,}200} = \mathbf{\$314{,}200}$$

$$D_S = C_S - ND_S = \mathbf{\$314{,}200} - \$106{,}200 = \$208{,}000$$

Using the **appropriate** ICER (Equation 2), it was much lower and the *drug cost* reduction required was a substantially greater reduction (49.69 %).

Results (cont.)

$$C_S = (17.83 - \mathbf{17.38}) * 150{,}000 + \mathbf{182{,}500} = \mathbf{\$250{,}000}$$

$$D_S = C_S - ND_S = \mathbf{\$250{,}000} - \$106{,}200 = \$143{,}800$$

Figure 2 shows points representing the original E_S and C_S (SEM_0), the C_S ICERO claims is needed (SEM_1, using WTP = $\mathbf{ICER_{S/LS}}$) and the C_S we show is needed (SEM_2) using WTP = $\mathbf{ICER_{S/P/T}}$. The total cost reduction is considerably more than ICERO would claim ($285,800 - $143,800 = **$142,000** instead of $285,800 - $208,000 = **$77,800**).

Table 1: Costs and QALYs for 5 Treatments

Treatment	Total Cost (C)	QALYs (E)
LS	$179,200	16.93
B/N -DOMINATED	$207,300	17.16
LIR - DOMINATED	$377,000	17.34
P/T	$182,500	17.38
SEM	$392,000	17.83

Conclusion

Despite its incorrect method, ICERO identified the cost-effective treatment, but its approach will result in errors generally. It erred in estimating the cost reduction to make SEM cost-effective - because of its incorrect ICERs. For the same reason it also incorrectly claimed that B/N would be cost-effective at higher WTPs. ICERO's stature demands its methods must be unassailable; it must evolve to meet that requirement.

Figures

Figure 1: Cost-Effectiveness Plane with ICERO's incorrect ICERs and the Appropriate ICERs (solid lines)

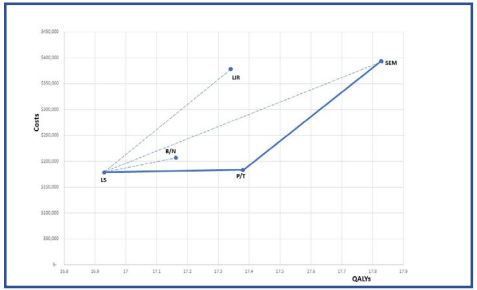
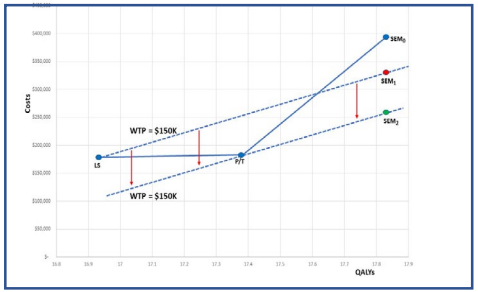


Figure 2: Reduction in SEM costs to Make It Cost-Effective (ICERO at SEM_1; Correct at SEM_2)



References

[1]Glick H et al *Economic Evaluation in Clinical Trials* Oxford University Press; 2014

[2]Garber AM. Advances in cost-effectiveness analysis of health interventions. In: Culyer AJ, Newhouse JP, editors. Handbooks in economics. 1. 1st ed. Amsterdam ; New York: Elsevier; 2000