MSIS 638

Case 2.3b

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1. Search what “quality adjusted life years (QALY)” means. Describe what it means in your words. Make sure you cite the references you use.

Quality adjusted life years (life-years \* quality of life) is represented by utility. QALY is a measure of the value of health outcomes to the people who experience them. It takes account into how long a people going to live as well as the quality of the people have had well a lot. There are combined with two different quantitative treatment, which is length of life and quality of life. To sum up, QALY is a common measure of disease burden, including both the quality and the quantity of life lived. It is used in economic evaluation to assess the value of medical interventions. For example, one QALY equates to one year in perfect health. The score range of QALY from 1 to 0 as a one-year criterion of QALY. (prefect healthy 1 to dead 0)

Reference

<https://www.youtube.com/watch?v=3tDXwKVkn68>

<https://www.youtube.com/watch?v=n7R6NOj7fpM>

<https://en.wikipedia.org/wiki/Quality-adjusted_life_year>

1. Come up with an example *of your own* that demonstrates how QALY can be used to decide between two treatments for the same health issue. *You need to provide numerical analysis.*

For example, if a man got a lung cancer, let us assume the man without a proper treatment, he will have only 2.5 years to live (life-years). With treatment, he will live for another 3 years (life-years). The incremental health effect would be 2.5 Life Year Gained (LYG). (The incremental health effect= 3.0-2.5 = 0.5 LYG)

In this case, the quality of life (utility) is 0.5/1 in the situation without treatment and life-years as mentioned above is 2.5 year. So, the QALY of this man will be 1.25 QALY (2.5 (life-years) \* 0.5 (quality)).

In the condition with treatment, the quality of life (utility) will be 0.8 for the first two years and 0.7 in the third year (the efficacy of the treatment decreases with time). The QALY will be (2\*0.8+1\*0.7) = 2.30. (Total life-years is 3 years as mentioned above)

The difference between treatment and non-treatment is 0.95 (2.30 - 1.25) for additional quality. We can find out that quality of life (utility) will consider for QALY. For this scenario, these two treatments play a role as determining the life quality and life years. The difference of two treatments in the same health issue will shows a clear picture of how many additional years and what life condition (quality) that person can live.

1. How much the inferior treatment should be improved to be as good as the superior treatment? This is an important and useful sensitivity analysis.

According to the question (b) mentioned above, the inferior treatment can only extend the man’s QALY is 2.30, extending his life for three years. What if we improve the treatment by a superior one to cure the lung cancer? A superior treatment can add mor time to the patient by 6 years. So, the QALY would be 4.4 (3\*0.8+2\*0.7+1\*0.6) since the effectiveness of the treatment will decline gradually.

4.4 - 2.3 = 2.1 (QALY) and extend for another 3 years.

For the cost effectiveness (assumption):

The total investment cost for Option A (2.3) is $2000, $/QALY is $870

The total investment cost for Option B (4.4) is $3900, $/QALY is $886

To sum up, the inferior treatment needs to increase $16 per QALY (886 - 870) to catch the superior treatment.

1. What are the main challenges in implementing the QALY methodology?

There is a challenge that people would not notice the QALY benefit behind the whole picture of gaining extra life year. For example, people usually upset to the drug company about their high charging fee on medicine and drugs. However, in the scheme of things, it is cost-effective for the drug company to increase people QALY by that sort of adjustments.

Another thing is QALY depend on the utility of the treatments, if the half-period or effectiveness of the treatment declining quick, then implying the QALY methodology will be hard to achieve the expected function. Also, ethic issue for the CDC and government policies will be a challenge for implying this methodology. People may think why the government have the right to decide the life cycle for the people. However, things are always more complicated than that.

QALYs have been criticized on technical and ethical grounds. A salient problem relies on the numerical nature of its constituent parts. The appropriateness of the QALY arithmetical operation is compromised by the essence of the utility scale (citied from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC317370/>)

1. What are the underlying assumptions of the QALY methodology?
2. For underlying assumptions, QALY based on entity treatment, excluding other medical fields such as psychology.
3. The underlying measure of utility is derived from clinical trials and studies that measure how people feel in these specific states of health.
4. The amount of time people lives in various states of health. This information usually comes from clinical trials.
5. Investment cost of the treatment from initial to end will be a positively growth to QALY per dollar.
6. In QALY, we assume that a major objective of decision- makers is to maximize health or health improvement across the population subject to resource constraints.
7. Health or health improvement can be measured or valued based on amounts of time spent in various health states.
8. Do these assumptions always hold in reality? Give an example for why some of these assumptions may not always hold.

There are some reasons I do not think the assumptions of QALY can always hold under real-world setting. For example, it is hard to quantify all the disease and health condition to a standard evaluation, such as chronic or mental diseases. Also, the efficacy of some treatments is not directly proportional to time, so, it is difficult to equate the quality of life and life-years between treatments.