Assumptions

# Assumptions Relevant to the Model

1. Single Cancer Type
   1. No differentiation between small cell and non-small cell cancer
2. Each month is 30 days
3. 30 Replications, 3 years warm up, 3 years after warm up
   1. Allows for a model to enter a steady-state
4. Arrival rate has no trend/seasonality and follows poisson distribution
   1. It is assumed that on average 34 patients outside of the system are arriving per day
   2. Given our parameters that makes it almost exactly same as capacity
   3. This arrival rate was estimated using a variation of the model, where arrival rate is variable depending on the queue size.
      1. All the other parameters were the same; the duration was set for 20 years.
      2. It resulted in an average of 32.5 arrival per day
      3. Details are shown in the “Time to Serve Current Population” output folder
5. Service time follows exponential distribution and is 15 minutes
   1. CT Machines are available from 8:00 to 16:00 on weekdays
6. If a patient arrives at the end of work day, it is allowed to scan them such that the time patient leaves is after 16:00.
   1. This is where utilization of over 100% comes from
7. If a patient receives two negative scan results, they leave the system.
   1. There doesn’t seem to be any evidence that people’s scan results change significantly after annual returns (for example: [link](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4705835/) (look at baseline vs next screening))
   2. In general in papers only 1 post baseline screening is talked about. To be safe, we are assuming 2.
8. 9% of patient with negative scan results leave the system. This percentage is the same as number of patient choosing to not continue with screening after their risk assessment
   1. Potentially could be changed to (62.6%) as seen [here](https://www.annalsthoracicsurgery.org/article/S0003-4975(18)30262-5/fulltext) (table 2 – rates of adherence)
9. Probability of positive biopsy is different between suspicious and positive scan results. The overall probability is 75%. We assume 85% for positive and 75% for suspicious.
10. Cancer stage 3&4 initial probabilities were grouped (at 30%), it is assumed stage 3 and stage 4 both have 15% probability
11. Probability of having a more severe cancer is higher the longer a person waits in queue.
    1. It changes as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Stage 1** | **Stage 2** | **Stage 3** | **Stage 4** |
| **0-6 Month** | 63% | 7% | 15% | 15% |
| **6-12 Month** | 56.63% | 6.29% | 16.85% | 20.22% |
| **12-18 Month** | 49.53% | 5.50% | 18.43% | 26.54% |

* 1. Description of the change:
     1. Each 6 month, Stage 3 Probability is multiplied by 1.25. Stage 4 is multiplied by 1.5
     2. It is then normalized to have a sum of 100%
     3. This is done in an attempt to imitate the time to double for cancer

# Number of people available for screening

1. Population of National Capital Region (1.3 mil) \* Proportion of people eligible for lung cancer screening based on the smoking rates and age criteria (31.9%) = 414,700
2. 414,700 \* Risk prediction model probability (33.3%) = **138,233**