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 23 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. More details are in the results
      1. All the other parameters were the same, the duration was set for 12 years.
      2. It resulted in an average of 22.7 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. Scan results are dependent on the number of times a patient has returned to be scanned again
   1. The following is a table of scan probabilities

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Positive Scan** | **Suspicious Scan** | **Negative Scan** |
| **Initial Visit** | 85% | 13% | 2% |
| **1st Return** | 47.5% | 29% | 23.5% |
| **2nd Return and onwards** | 10% | 45% | 45% |

* 1. This is done for the following reasons:
     1. Reduce the unrealistic effect, where a patient can return many times before they leave the system. (Sometimes over 40 times)
     2. (**NEED SOME RESEARCH TO BACK IT UP**) It seems reasonable that patient will have higher chance of cancer over time

1. 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
2. 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. (**FIND SOME SOURCES FOR IT IDK**)
3. Cancer stage 3&4 initial probabilities were grouped (at 30%), it is assumed stage 3 and stage 4 both have 15% probability
4. 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**