**HPM573 final project proposal**

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Lung cancer is the leading cause of cancer-related deaths in the United States [1]. However, until recently, no method of screening had been shown to reduce mortality from lung cancer [2]. Among risk factors of lung cancer, tobacco smoking is the most important modifiable one. Smoke of cigarette contains at least 50 carcinogens, including polycyclic aromatic hydrocarbons (PAHs), aromatic amines, and other organic and inorganic compounds. It is estimated that up to 20% of all cancer deaths worldwide can be prevented by the elimination of tobacco smoking [3]. Never smokers are also susceptible to lung cancer. The overall global statistics estimate never smokers accounting for 25% of all lung cancer cases worldwide [3]. In order to ameliorate mortality rate of lung cancer, several screening interventions with criteria for high-risk population have been applied in for early diagnosis and therapy. The National Lung Screening Trial (NLST) showed that screening with low-dose computed tomography (LDCT) of the chest can reduce 20% lung-cancer mortality rate in patients at high risk for lung cancer [4]. LDCT has been recommended by several major medical-societies for patients with high risk of lung cancer. However, the cost-effectiveness of this screening intervention varied from vary favorable to unfavorable in previous studies [2].

Selection criteria might have significant influence on the cost-effectiveness of LDCT. NLST used a selection criteria for populations that only those with high risk (e.g., ≥30 pack-years of smoking and <15 years since quitting) are eligible for the screening test. Another research developed and validated a lung-cancer risk-prediction model by using data from former and current smokers in the Prostate, Lung, Colorectal and Ovarian (PLCO) Cancer Screening Trial control and intervention groups. After modifying this model and making it more applicable to NLST data, the new model (PLCOM2012) was more sensitive than the NLST criteria for lung-cancer detection.

We are interested in analyzing the cost-effectiveness of LDCT screening test for lung cancer based on PLCOM2012 selection criteria. Since the implementation of screening test would be a financial burden and bring huge impact to its incremental cost-effectiveness ratio (ICER), it would be necessary for policy makers to get general information on relatively good implementation method when deploying the lung cancer screening. No current research analyzed cost-effectiveness of PLCOM2012 criteria. Thus, we intend to assess the cost-effectiveness of LDCT with PLCOM2012 criteria by simulating and compare it the cost-effectiveness with general NLST criteria.

Our project is based on several assumptions. First, the LDCT screening did not affect the mortality from causes other than lung cancer. Second, we assume observations in two study are independent. Third, all individuals in both studies would be regarded as alive if they don’t die until the last day of follow-up and would be considered for life-time horizon.

We would use data from Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer screening Trial with the PLCOm2012 selection criteria and The National Lung Screening Trial with NLST criteria. The datasets include more than 70,000 smokers in the PLCO study and more than 50,000 NLST participants for whom epidemiologic data are available. Our interested outcomes include the cost for intervention and the effect of the screening test. The cost includes both medical cost like the screening test, the follow-up treatment cost and significant unmedical cost like waiting-time. The effectiveness can be measured using both life years and quality-adjusted life years (QALY). And the discounted for both costs and QALYs at the customary rate of 3% would be considered. We would consider relatively long-term CEA, thus the range of effectiveness is based on lifetime duration. Estimations of life-years would be based on the number of observed deaths that occurred during the trial and the projected survival of persons who were alive at the end of the trial[2]. Life years gained represents the difference between how long people lived on average after receiving the intervention versus without it. On the other hand, QALYs include effects on morbidity, the duration of life is multiplied by a coefficient estimating the average health state utility, which varies from 0(death) to 1 (perfect health). We would choose our coefficient from literature.

The major conclusion for our study would be the ICER for the LDCT based on PLCOM2012 selection criteria. Considering the effectiveness of LDCT like false-positive rate would vary in different age groups or sex, and the cost would vary a lot for different stage of lung cancer. We thus categorize patients into different subgroups based on stage, age and sex to better see the ICERs change, which can give us a better idea on the influence of ICERs brought by the implementation of screening test. For the stability of our model, we would conduct sensitivity analysis under different parameters to evaluate how the model works under different conditions. We would expect big difference in results of sensitivity analysis based on different values of our input parameters, regarding to the fact that the cost-effectiveness of LDCT of lung cancer has not been fully studied and results of previous studies varies from very favorable to unfavorable. we would take the participation rate of the screening test into consideration to see its influence on cost-effectiveness results.

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