

P1.047: Efficacy of Lung Cancer Screening With Adherence in Centralized Versus Decentralized Programs: A Simulation Modeling Study

Jihyoun Jeon¹, Koen de Nijs², Justin Lee³, Roger Y. Kim⁴, Anil Vachani⁵, Debra P. Ritzwoller⁶, Pianpian Cao⁷, Harry J. de Koning², Sylvia K. Plevritis³, Kevin ten Haaf², Summer S. Han³, Rafael Meza⁸

¹University of Michigan, USA, ²Erasmus MC–University Medical Center, The Netherlands, ³Stanford University, USA, ⁴University of Pennsylvania, USA, ⁶Kaiser Permanente Colorado, USA, ⁷Purdue University, USA, ⁸British Columbia Cancer Research Institute, Canada; **Correspondence:** jihjeon@umich.edu

INTRODUCTION

- Annual lung cancer screening with low-dose computed tomography (LDCT) has been recommended for high-risk individuals in the US since 2013
- However, uptake and adherence remain suboptimal across the US
- Subpar uptake and adherence could greatly reduce the potential population-level health gains from LDCT screening
- We project the long-term health outcomes of LDCT screening in the US under real-world patterns of uptake and adherence, using data from five US healthcare systems

METHODS

- Population-based Research to Optimize the Screening Process (PROSPR) Lung Consortium - Data on longitudinal adherence to recommended follow-up for positive and negative LDCT screens¹
- Adherence rates in decentralized (N=6,199) and centralized (N=3,834) screening programs; varying screening uptake, ranging from 10% to 100% in 10% increments
- Three Cancer Intervention and Surveillance Modeling Network (CISNET) lung cancer microsimulation models^{2,3} to project long-term health outcomes from LDCT screening under the 2021 USPSTF screening guidelines
- Modeled outcomes (per 100,000 individuals from the US 1960 birth cohort) included the number of LDCT screens, lung cancer deaths averted (LCDA), life-years gained (LYG), false-positive screens, and overdiagnosed cases

DISCUSSION AND CONCLUSION

- Long-term health gains among individuals screened in centralized screening programs would be considerably greater than those in decentralized programs
- But these will also require additional resources as more screens and follow-up tests would be needed in centralized screening programs
- It is also likely that centralized programs could reach higher uptake rates, thereby multiplying their benefits (and resource demands) relative to decentralized programs
- While centralized programs are clearly superior, other factors, such as costs and ease of implementation, should be considered to inform optimal choices for specific healthcare systems

REFERENCES & ACKNOWLEDGEMENTS

References

- Kim RY, Rendle KA, Mitra N, Neslund-Dudas C, Greenlee RT, Honda SA, Schapira MM, Simoff MJ, Jeon J, Meza R, Ritzwoller DP, and Vachani A. Adherence to Annual Lung Cancer Screening and Rates of Cancer Diagnosis. *JAMA Netw Open*. 8(3):e250942 (2025).
- Meza R, Jeon J, Toumazis I, Ten Haaf K, Cao P, Bastani M, Han SS, Blom EF, Jonas DE, Feuer EJ, Plevritis SK, de Koning HJ, Kong CY. Evaluation of the Benefits and Harms of Lung Cancer Screening With Low-Dose Computed Tomography: Modeling Study for the US Preventive Services Task Force. *JAMA*. 325(10):988-997 (2021).
- Cao P, de Nijs K, Lee J, Jeon J, de Koning HJ, Plevritis SK, Ten Haaf K, Han SS, and Meza R. Performance of smoking duration-based lung cancer screening eligibility criteria: a comparative modeling study. *J Natl Cancer Inst*. 118(6):1015-1024 (2026).

Artificial Intelligence (AI) Use Disclaimer

No AI tools were used and all scientific content, analyses, and interpretations were developed and conducted by the authors.

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RESULTS

	Negative screen results in the prior year	
	Decentralized	Centralized
T1 adherence	47.5	84.4
T2 adherence	60.8	79.3
	False positive screen results in the prior year	
	Decentralized	Centralized
T1 adherence	53.0	72.0
T2 adherence	48.2	53.1

Table 1. Conditional adherence rates given the screen results in the prior year from PROSPR Lung Consortium

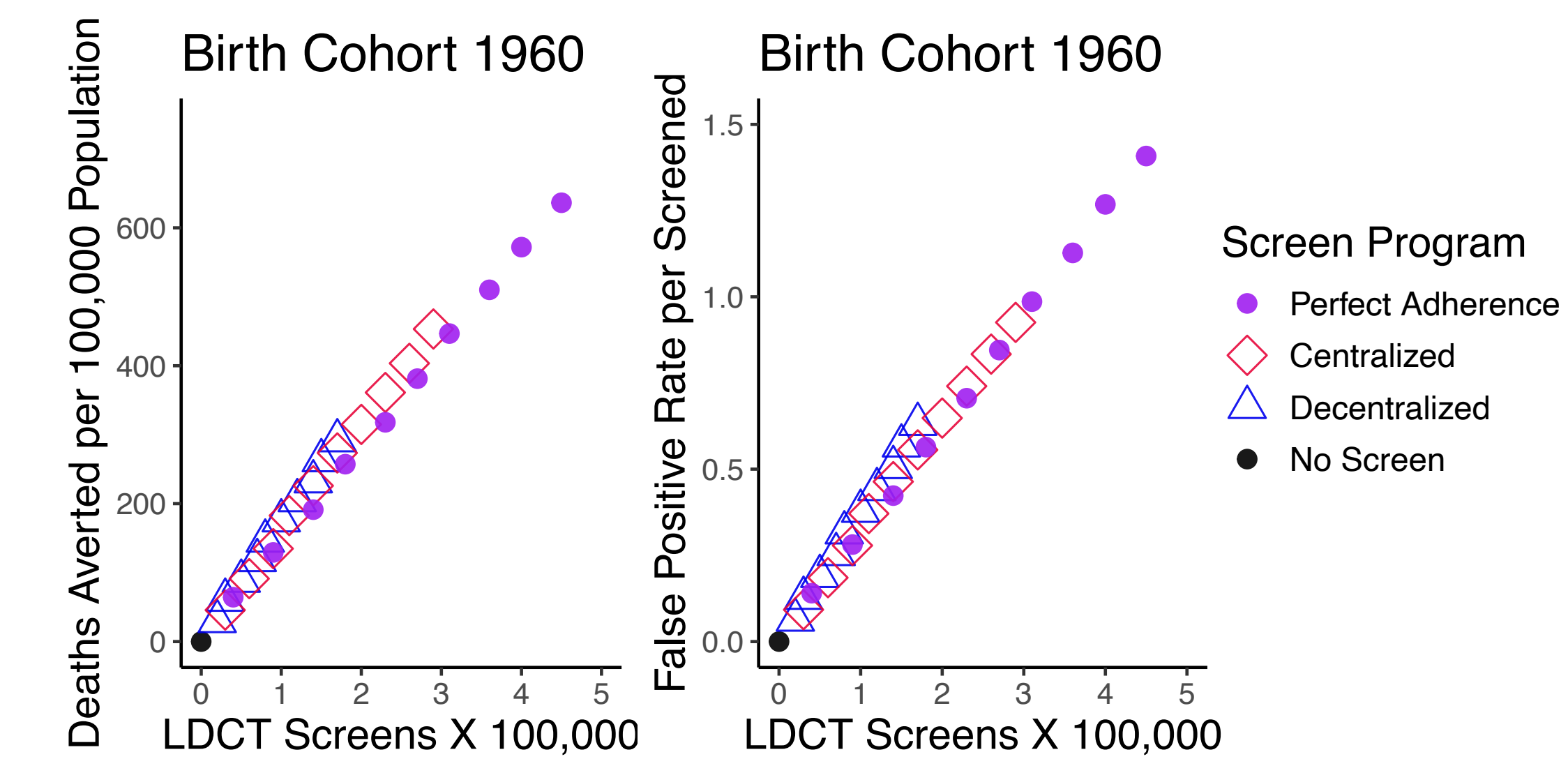


Figure 1. Average LCDA (benefits) and false positive rates (harms) across three models

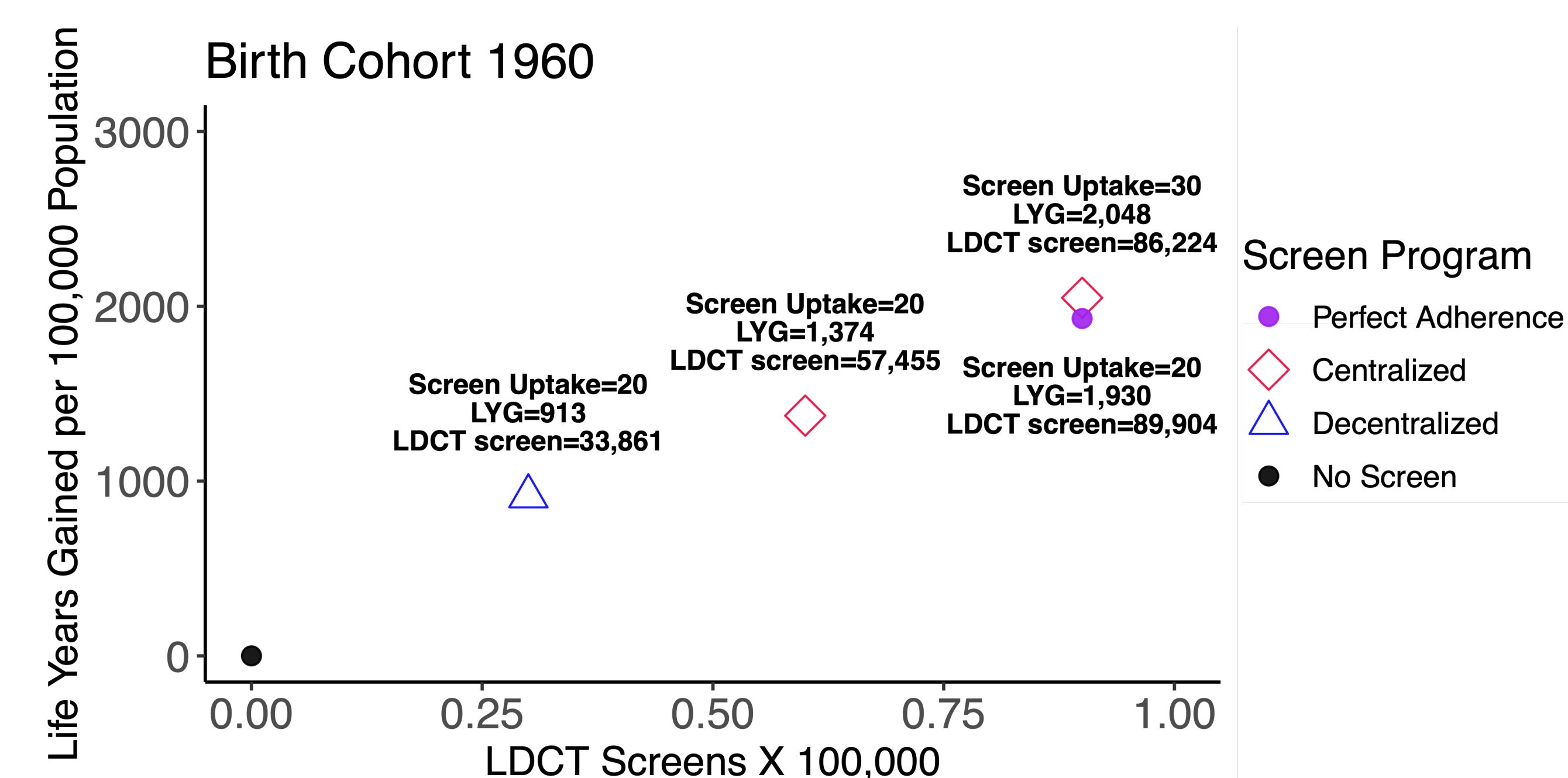
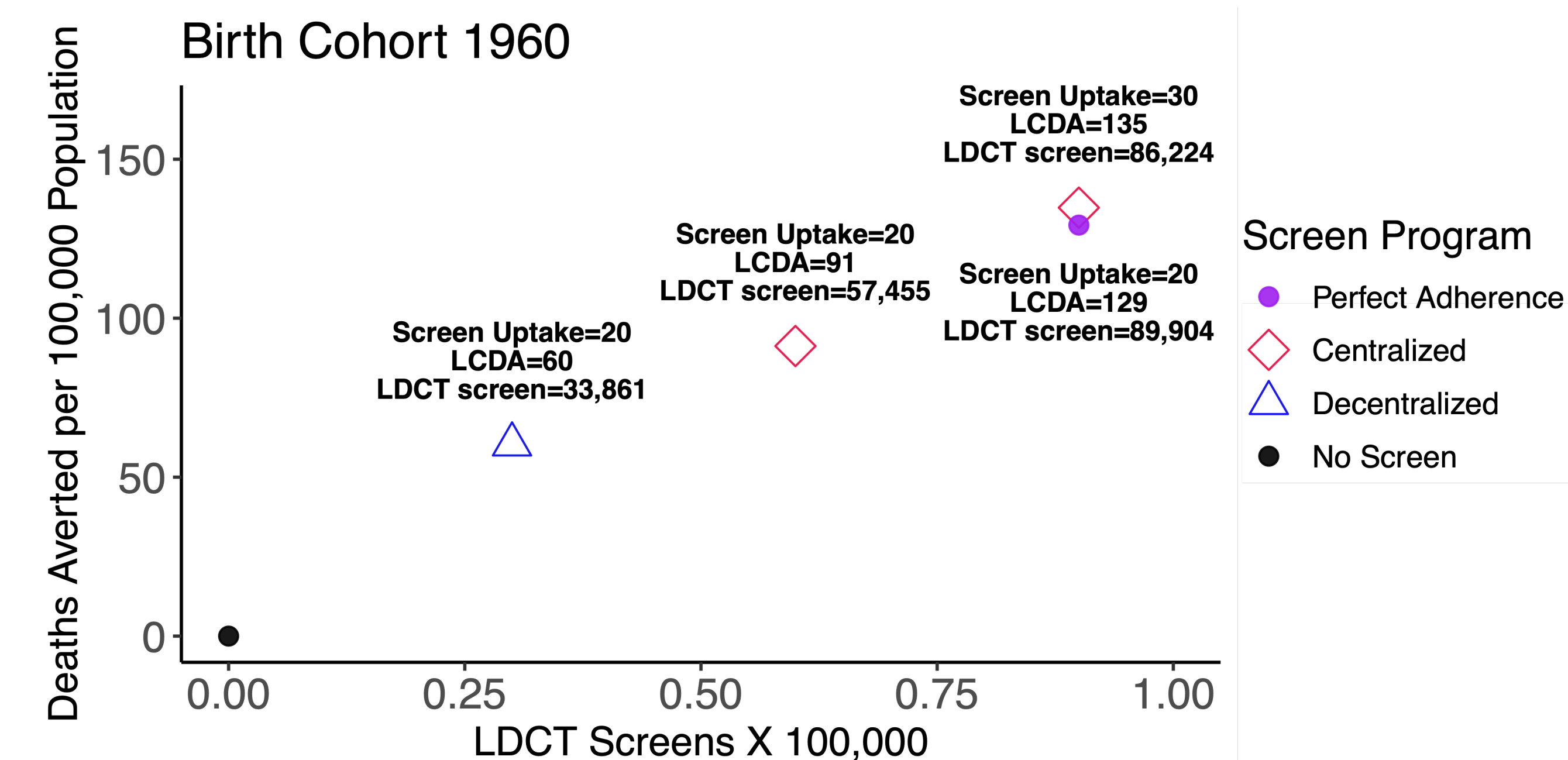


Figure 2. Average LCDA and LYG across three models for selected screen uptake scenarios

- At the current US uptake rate of 20%, centralized programs—which achieve higher adherence—avert approximately 52% more lung cancer deaths and yield 50% more life-years than decentralized programs (91 vs. 60 LCDA; 1,374 vs. 913 LYG per 100,000), while performing 70% more LDCT screens (57,455 vs. 33,861)
- Relative to a 20% uptake with adherence from centralized programs, increasing uptake to 30% would increase LCDA by 48%, LYG by 49%, and LDCT screens by 50%
- Under a perfect-adherence scenario with 20% uptake, 129 LCDA and 1,930 LYG would occur, requiring 89,904 LDCT screens
- With perfect-adherence and 100% uptake, these would increase to 636 LCDA, 9,666 LYG, and 449,781 LDCT screens
- Overdiagnosed cases would be slightly higher in centralized programs due to the higher screening rates