Supplementary Online Content

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eMethods. CISNET Lung Model Descriptions

Model 1: Erasmus-MISCAN

The Erasmus-Microsimulation Screening Analysis (MISCAN)-Lung Model is a microsimulation model that simulates a population of individual life histories. For each individual, a smoking history (including never smoking) is generated using the Smoking History Generator (SHG).[1] Lung cancer is modeled through a multistep procedure. Once a person's age at death from causes other than lung cancer is generated by the SHG, which is influenced by the person's smoking history, the integrated Two-Stage Clonal Expansion (TSCE) model is used to determine whether lung cancer develops in that individual.[2,3] MISCAN-Lung distinguishes four histological types of lung cancer: squamous cell carcinoma, adenocarcinoma, other non-small cell carcinoma, and small-cell carcinoma.

Once lung cancer has developed, it progresses to more advanced preclinical stages until it is detected. Lung cancers can be detected either clinically (due to symptoms) or by screening. The incidence of clinically detected lung cancers depends on the preclinical duration and the probability of clinical detection, which both vary by cancer stage and histology (and sex for the preclinical durations). Data from the National Lung Screening Trial (NLST) and the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial (PLCO) were used to calibrate MISCAN-Lung, from which information on the natural history and screen detectability of lung cancer was derived.[4-7] Through incorporating information on the preclinical duration, probability of clinical detection, and screen detectability of lung cancer, as well as a person's death from causes other than lung cancer, MISCAN-Lung can account for the effects of lead time and overdiagnosis.

If screening does not occur, lung cancers can only be clinically detected. If persons die of lung cancer before dying from other causes, their ages of death are adjusted accordingly. Upon activating the screening component, preclinical lung cancers may be detected by screening, which may cure patients, allowing them to resume their normal (cancer-free) life history. The probability of cure differs by the stage of cancer at detection and was based on data from the NLST. Upon clinical or screen detection (if no curation occurs) of lung cancer, the patient is assigned a histological type-, stage- and sex-specific survival time, which follows a piecewise uniform distribution.

In the decision analysis, the model evaluated different properties of the screening test (such as sensitivity), and various screening policies (e.g., starting/stopping age, screening frequency, smoking eligibility criteria) can be specified. For each of these properties and screening policies, the model can evaluate various simulated events in the presence and absence of screening, such as the mortality due to lung cancer and other causes, life-years gained, and overdiagnosis.

MISCAN-Lung has previously been used to evaluate the effect of tobacco control on U.S. lung cancer mortality.[8] MISCAN-Lung contributed to the analyses of the CISNET Lung Group, which were used to inform the U.S. Preventive Services Task Force (USPSTF) for their 2013 recommendations for lung cancer screening.[4,9-11] The model was used to evaluate the cost-effectiveness of lung cancer screening in Ontario, Canada.[12] The model was also used in recent comparative modeling studies by the CISNET Lung Group: 1) evaluation of the effects of risk-stratified screening[13] and 2) analysis of the cost-effectiveness of lung cancer screening in the United States.[14]

Model 2: MGH-HMS

The Massachusetts General Hospital–Harvard Medical School (MGH-HMS) group's model is a comprehensive state-transition microsimulation model that simulates a patient's lung cancer development, progression, detection, followup, treatment, and survival.[9,10,15-22] The MGH-HMS model was originally developed to evaluate the clinical effectiveness and cost-effectiveness of low-dose computed tomography (LDCT) screening for lung cancer.[17,18,20] The model has been extended to estimate the effect of reduced tobacco smoking on lung cancer mortality in the United States,[21] the number of radiation-induced cancers from lung cancer screening,[9,16] cost-effectiveness of followup of incidentally detected pulmonary nodules,[15] and effectiveness of treatment strategies for stage IA/IB non-small cell carcinoma patients who were nonoperative candidates.[22] The model was used in the 2013 CISNET lung cancer decision analysis for the USPSTF.[4,9,10]

The MGH-HMS model is a Monte Carlo microsimulation model coded in C++. The model initially populates with disease-free persons who then go through different health states according to monthly transition probabilities. In each monthly cycle, an individual may develop lung cancer, have an existing cancer grow, or develop symptoms or metastases. The risk of lung cancer is related to persons' smoking history, which is updated monthly (the model also includes cancers in nonsmokers). Smoking exposure history is supplied by the SHG. Lung cancers can be detected by an evaluation of symptoms through incidental imaging or by LDCT screening (with different tumor behavior for screen-detected cases). Persons with suspected lung cancer receive diagnostic and staging tests and then may undergo treatment. The screening module can be turned on and off to allow for analyses of treatment effectiveness for screen-detected vs. nonscreen-detected cases.

Each simulated individual in the MGH-HMS model can develop up to three cancers from any of five lung cancer cell types (adenocarcinoma, large cell, squamous cell, small cell, and other non-small cell carcinoma). For each cell type, the monthly probability of cancer development is described by a logistic equation with seven natural history parameters: a type-specific intercept, type-specific coefficients for age, age squared, years of cigarette exposure (pack-years), an interaction term between pack-years and age squared, the mean number of cigarettes smoked per day (cigarettes per day), and the years since quitting smoking. The MGH-HMS model also explicitly simulates the followup schedule of small incidentally detected or screen-detected lung nodules, which allows the model to examine the effectiveness of followup recommendations by the Fleischner Society or the Lung Imaging Reporting and Data System (Lung-RADS). In the MGH-HMS model, the levels of simulated disease characteristics allow the staging of patients according to the Tumor Node Metastasis classification,[23] permitting the model to simulate the most up-to-date treatment options according to current clinical practices. The natural history parameters related to unobservable events (i.e., the initiation of the first cancer cell) were estimated by calibrating the model using Surveillance, Epidemiology, and End Results (SEER) registry data (cancer incidence by cell type, stage distribution at diagnosis, and stage-specific survival), published cohort studies, and clinical trial data. The details of model calibration and validation of the original natural history parameters have been described in our previous publications.[4,24]

The MGH-HMS model's flexibility allows for evaluation of multiple components in a lung cancer screening program, including screening eligibility, smoking cessation, followup,

staging, and treatment. Improvements in any of these components may affect patient outcomes and may influence the effectiveness of interventions in other areas. The MGH-HMS model does not rely on data from a single trial to inform the parameter estimates but rather incorporates data from multiple sources and can incorporate new data as they emerge. The MGH-HMS model can thus be used to evaluate screening in populations not included in ongoing trials and can address the "moving target" problem of improved test performance or treatment effectiveness.

Model 3: Stanford-LCOS

The Lung Cancer Outcomes Simulator (LCOS) Model (Stanford University) is based on a natural history model of lung cancer that assumes exponential growth for the primary tumor and growth of metastasis proportional to the primary tumor growth.[4,25] The natural history model simulates the individual's tumor growth in the absence of any intervention, based on sex and histologic subtype, providing outcomes such as tumor volume doubling time, time for onset of metastasis, tumor size at clinical detection, and survival time. The parameters of the natural history model are estimated using SEER survival data.

In the natural history model, the primary tumor grows exponentially with growth rate r, and its corresponding tumor volume doubling time is given as (log2)/r. When the tumor reaches a certain size (Vp), it prompts symptoms that lead to a clinical detection of the primary tumor. The tumor volume and the growth rate parameter are modeled as a bivariate log-normal distribution. Fatal metastases start growing at a certain time, and we assume that the volume of the primary tumor at this time (Vc) is a threshold for cure (cure threshold) so that only if the primary tumor is detected and treated earlier than this point is the patient cured. The metastatic burden grows proportionally to the primary tumor size with fraction "f" until it reaches a maximum burden size (BD). The time at which BD is reached is a survival time if the primary tumor is not detected and treated before reaching the cure threshold. If this metastatic burden grows to a certain size (c1BD, where $0<c1<1$), it becomes an observable metastasis; thus, if detection (either clinical or screen detection) occurs earlier than this point, the tumor is staged as early stage. Otherwise, the tumor is staged as advanced. When the metastatic burden grows to a certain size (c2BD, where $0<c2<1$), it becomes clinically symptomatic; hence, detection is due to either the primary tumor or metastasis, depending on which becomes symptomatic first.

The LCOS superimposes a specific screening intervention to each individual and estimates individual-level outcomes, which can be aggregated for evaluating population-level outcomes. Key inputs for the LCOS include sex, individual-level smoking history (e.g., pack-years and age for starting/quitting smoking), and age of entry to the screening program. The LCOS uses the TSCE model to predict annual hazards for lung cancer incidence in the absence of screening given smoking history, sex, and age.[3] The parameters of the TSCE model were estimated based on data from Nurses' Health Study (NHS)/Health Professionals' Followup Study (HPFS) with further adjustments.[26]

For each lung cancer, a histologic subtype (adenocarcinoma, squamous, large cell, or small cell) is assigned by sampling from the observed proportions from SEER data. The lung cancer cases with indeterminate diagnosis follow the Lung-RADS guidelines,[4] which are explicitly incorporated in the LCOS.[26] The LCOS compares the performance of the screening program of interest against the no-screen scenario estimating the benefit of screening. It can estimate sex-specific benefits and harms of screening strategies with various starting and

stopping screening ages, smoking exposure levels, screening frequencies, and followup protocols. Outcome measures include lung cancer deaths avoided, all-cause and lung cancer–specific mortality reduction, number of detected cases by mode of detection, number of screening examinations, number of false-positive results, and number of overdiagnosed cases, among others.

Model 4: University of Michigan

The University of Michigan (UM) Lung Cancer Screening Model is a combination of a multistage carcinogenesis model and a discrete-state microsimulation model. The model was developed to evaluate the effect of screening on lung cancer incidence and mortality, survival outcomes, overdiagnosis, and quality of life. This model consists of two components: natural history and screening. It was used for the 2013 USPSTF lung cancer screening decision analyses[4,9] but has been updated considerably to simplify its use and enhance its applicability. The model was recently used to assess the cost-effectiveness of LDCT in the United States[14] and the effect of risk-based screening strategies in collaboration with the other CISNET Lung groups.[13]

The natural history component simulates individual lung cancer–oriented life events in the absence of screening given the individual's smoking history. The age at clinical detection of lung cancer (dose-response) is simulated through a TSCE model.[2,3] The TSCE model assumes that two mutation (rate-limiting) events are required for the initiation of premalignant lung tumors, and it explicitly models the dynamics of premalignant and malignant tumors. The TSCE model was fitted to lung cancer incidence in the NHS and the HPFS using a likelihood-based approach. If an individual develops clinically diagnosed lung cancer, the natural history model also simulates the age at lung cancer onset, histology, stage at diagnosis, preclinical sojourn time for each stage, and age at lung cancer death. Lung cancer histology is classified into four main groups: small cell, adenocarcinoma, squamous, and other. Histology is simulated using a multinomial logistic regression accounting for sex, age, and smoking exposure model based on the PLCO. Preclinical sojourn times for each stage follow a Weibull distribution with shape and scale parameters depending on sex, stage, and histology.[5] The preclinical sojourn times are simulated for all stages for each clinically diagnosed lung cancer case and used in the screening component to model the effect of screening. Lung cancer–specific survival time conditioned on sex, age at diagnosis, histology, and stage is estimated by using cure models with lognormal survival distributions, which were fitted to lung cancer survival data in SEER 18.

The outputs from the natural history component serve as inputs for the screening component to simulate the effect of screening on lung cancer incidence, stage, and survival. The model uses sensitivity and specificity rates to simulate screening results: true positive, false positive, or negative. Sensitivity estimates were obtained from ten Haaf et al[5] and vary by screening round, lung cancer histology, and stage. These estimates, originally based on NLST, were adjusted to conform to Lung-RADS criteria by multiplying them by a scaling factor, given by the ratio of the overall sensitivity from Lung-RADS over that from NLST.[27] Specificity rates by screening round were also based on a retrospective analysis of NLST outcomes using the Lung-RADS criteria.[27]

The model simulates additional screening outcomes such as the number of followup tests and potential complications based on NLST rates.[6,28] The rates of specificity and sensitivity for

screening simulation were chosen based on other published literature.[5,6,28] For true-positive cases, lung cancer–specific survival time and stage burden were updated given the stage and age at diagnosis.

A version of this model using an alternative dose-response model (Bach's lung cancer risk model[29]) was recently used to evaluate the preference-sensitivity of LDCT at different levels of underlying risk.[30]

eTables

eTable 1. Characteristics of the Four CISNET Lung Group Models Used in the Collaborative Modeling

Model Components	Erasmus-MISCAN Model 1	MGH-HMS Model 2	Stanford-LCOS Model 3	University of Michigan Model 4
Type of smoking dose-response model	2-stage clonal expansion model	Probabilistic by histology	2-stage clonal expansion model	2-stage clonal expansion model
Datasets used for dose-response parameter calibration	NHS/HPFS, SEER, NLST, PLCO by sex	SEER, NLST, PLCO by sex	NHS/HPFS, U.S. mortality by sex	NHS/HPFS, U.S. mortality by sex
Histological types	Adenocarcinoma+BAC+ large cell, squamous, SCLC, ONSCLC Distribution of histologies differs by sex	Adenocarcinoma, AIS, large cell, squamous, SCLC, and other	Adenocarcinoma, large cell, squamous, SCLC, BAC Distribution of histologies differs by sex	Adenocarcinoma+BAC, squamous, SCLC, other as a function of sex, smoking status, cigarettes per day, smoking duration, and years since quitting
Lung cancer stages	IA, IB, II, IIIA, IIIB, IV	IA1, IA2, IB, II, IIIA, IIIB, IV	Early (I-II), advanced (III-IV)	IA, IB, II, IIIA, IIIB, IV
Stage progression	Markov state-transition by histology and sex	Based on tumor volume and metastatic burden	Based on tumor volume and metastatic burden	Markov state-transition by histology and sex
Lung cancer survival	By sex, histology, and stage; based on SEER 18 2004-2010	Calibrated to SEER 18 2004-2013 survival	Based on SEER 17 1988-2003 survival differentiated by sex	By sex, histology, stage, and age at diagnosis; based on SEER 18 2005-2012
Other-cause mortality	U.S. rates (NCI Smoking History Generator) by sex	Cox model of OC mortality calibrated to NLST/PLCO	Gompertz model of OC mortality based on NLST calibrated model by sex	Gompertz model of OC mortality calibrated to each trial by sex
Screening sensitivity model	By stage and histology	By size (mm) and location in lung (central/peripheral)	By size (mm), histology, and sex	By stage, histology, and sex
Screening effectiveness	Cure model[a]	Stage-shift model[b]	Cure model[a]	Stage-shift model[b]
Positive nodule followup algorithm	Implicit based on the NLST	Explicitly modeled using Fleischner and Lung-RADS guidelines; lung cancers diagnosed on followup are categorized as “non-screened-detected”	Explicit model of Lung-RADS guidelines	Implicit based on Lung-RADS

[a] The benefit of screening is based on a stage-specific cure rate.

[b] The benefit of screening is based on an earlier stage at detection relative to clinical detection.

Abbreviations: AIS=adenocarcinoma in situ; BAC=bronchioloalveolar carcinoma; CISNET=Cancer Intervention and Surveillance Modeling Network; LCOS=Lung Cancer Outcomes Simulator; Lung-RADS=Lung Imaging Reporting and Data System; MGH-HMS=Massachusetts General Hospital–Harvard Medical School;

MISCAN=Microsimulation Screening Analysis; NCI=National Cancer Institute; NHS/HPFS=Nurses' Health Study/Health Professionals' Followup Study; NLST=National Lung Screening Trial; OC=other-cause; ONSCLC=other non-small cell lung cancers; PLCO=Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial; SCLC=small-cell lung cancer; SEER=Surveillance, Epidemiology, and End Results.

eTable 2. Risk Factor–Based and Risk Model–Based Eligibility Screening Strategies

Risk Factor–Based Strategies		
Screening/Modeling Parameter	Values/Ranges	Number of Options
Eligibility starting age	45, 50, 55	3
Eligibility stopping age	75, 77, 80	3
Screening frequency	Annual, biennial	2
Minimum pack-years criterion	20, 25, 30, 40	4
Maximum years since quitting	10, 15, 20, 25	4
Follow-up protocol[a]	Lung-RADS or NLST	1
Birth cohort	1950, 1960	2
Horizon	age 90	
Total # of strategies per cohort	288	
Risk Model–Based Strategies		
Screening/Modeling Parameter	Values/Ranges	Number of Options
Risk model	MPLCOm2012, MLCDRAT, Bach	3
MPLCOm2012 risk model thresholds[b]	*0.4%, 0.5%, 0.6%, 0.7%, 0.8%, 0.9%, 1.0%, 1.1%, 1.2%, 1.3%, 1.4%, 1.5%, 1.6%, 1.7%, 1.8%, 1.9%, 2.0%, 2.1%, 2.2%, 2.3%*	20
MLCDRAT risk model thresholds[b]	*0.4%, 0.5%, 0.6%, 0.7%, 0.8%, 0.9%, 1.0%, 1.1%, 1.2%, 1.3%, 1.4%,1.5%, 1.6%, 1.7%, 1.8%, 1.9 %, 2.0%, 2.1%, 2.2%, 2.3%*	20
Bach risk model thresholds[b]	*0.8%, 0.9%, 1.0%, 1.1%, 1.2%, 1.3%, 1.4%, 1.5%, 1.6%, 1.7%, 1.8%, 1.9%, 2.0%, 2.1%, 2.2%, 2.3%, 2.4%, 2.5%, 2.6%, 2.7%, 2.8%, 2.9%, 3.0%, 3.1 %, 3.2%, 3.3%, 3.4%*	27
Screening frequency	Annual, biennial	2
Lower age limit	50, 55	2
Upper age limit	75,77, 80	3
Birth cohort	1960	1
Total # of strategies	804	

a Models MGH-HMS, LCOS, and UM use Lung-RADS protocol/rates, while Model MISCAN uses NLST protocol/rates.

b Because the risk models produce different absolute risks, we considered a range of model-specific risk thresholds based on sensitivity in the PLCO control group and the percentage eligible for screening under each threshold in the 1960 birth cohort.

Abbreviations: Lung-RADS=Lung Imaging Reporting and Data System; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; PLCO=Prostate, Lung, Colorectal, and Ovarian.

eTable 3. Benefits of 57 Consensus-Efficient Risk Factor–Based Screening Programs Plus the 2013 USPSTF-Recommended Criteria Ordered by LDCT Screens—1960 Birth Cohort

Scenario	% Eligible	LDCT Screens	Screen-Detected Lung Cancer Cases	Lung Cancer Mortality Reduction (%)	Lung Cancer Deaths Averted	Life-Years Gained	Life-Years Gained per Lung Cancer Deaths Averted	LDCT Screens per Life-Years Gained	LDCT Screens per Lung Cancer Deaths Averted	NNS
B-55-75-40-10	9.0	64 607	569	4.5	173	2405	13.9	27	373	52
B-55-77-40-10	9.0	67 867	627	4.9	189	2523	13.3	27	359	48
B-55-75-40-15	9.3	70 408	601	4.7	183	2559	14.0	28	385	51
B-55-80-40-10	9.0	70 999	681	5.3	204	2610	12.8	27	348	44
B-55-77-40-15	9.3	74 368	663	5.2	201	2648	13.2	28	370	46
B-55-80-40-15	9.4	78 245	729	5.6	218	2751	12.6	28	359	43
B-50-77-40-10	9.5	79 248	634	5.0	196	2765	14.1	29	404	48
B-55-77-40-20	9.5	79 273	689	5.3	207	2743	13.3	29	383	46
B-50-75-40-15	9.7	81 993	606	4.9	189	2810	14.9	29	434	51
B-50-80-40-10	9.6	83 744	722	5.6	219	2910	13.3	29	382	44
B-55-80-40-20	9.6	83 861	761	5.9	227	2871	12.6	29	369	42
B-50-77-40-15	9.7	86 158	673	5.3	208	2940	14.1	29	414	47
B-55-80-40-25	9.6	87 795	782	6.0	232	2915	12.6	30	378	41
B-50-77-40-20	9.8	91 142	695	5.6	216	3029	14.0	30	422	45
B-50-80-40-15	9.8	91 757	769	6.0	234	3070	13.1	30	392	42
B-50-77-40-25	9.8	94 455	710	5.7	221	3104	14.0	30	427	44
B-50-80-40-20	9.9	97 823	806	6.3	246	3211	13.1	30	398	40
B-50-80-40-25	9.9	101 977	829	6.5	253	3269	12.9	31	403	39
B-55-80-30-15	14.1	116 975	876	6.9	266	3435	12.9	34	440	53
B-55-80-25-10	16.0	120 809	900	7.1	273	3519	12.9	34	443	59
B-55-80-30-20	14.5	128 506	929	7.3	282	3617	12.8	36	456	51
B-55-80-25-20	18.0	152 967	1029	8.1	313	4008	12.8	38	489	58
B-50-80-30-20	15.3	162 722	1003	8.0	312	4208	13.5	39	522	49
A-55-80-40-20	9.6	163 476	953	8.4	327	4058	12.4	40	500	29
B-55-80-25-25	18.3	165 874	1080	8.4	327	4173	12.8	40	507	56
B-55-80-20-15	20.6	169 689	1063	8.4	326	4215	12.9	40	521	63
A-55-80-40-25	9.7	171 482	981	8.7	336	4171	12.4	41	510	29
B-50-80-30-25	15.3	172 484	1047	8.4	324	4342	13.4	40	532	47
B-50-80-25-15	18.5	178 078	1051	8.4	327	4430	13.5	40	545	57
B-55-80-20-20	22.0	189 587	1134	9.0	348	4490	12.9	42	545	63
B-50-80-20-10	21.2	191 326	1061	8.6	333	4592	13.8	42	575	64
B-50-80-25-20	18.9	194 975	1115	8.9	346	4663	13.5	42	564	55
B-50-77-25-25	19.0	195 133	987	8.1	314	4582	14.6	43	621	61
B-55-80-20-25	22.7	207 010	1189	9.5	366	4701	12.8	44	566	62
B-50-80-25-25	19.0	208 753	1169	9.4	363	4859	13.4	43	575	52

Scenario	% Eligible	LDCT Screens	Screen-Detected Lung Cancer Cases	Lung Cancer Mortality Reduction (%)	Lung Cancer Deaths Averted	Life-Years Gained	Life-Years Gained per Lung Cancer Deaths Averted	LDCT Screens per Life-Years Gained	LDCT Screens per Lung Cancer Deaths Averted	NNS
A-55-80-30-15[a]	14.1	227 443	1102	9.8	381	4882	12.8	47	597	37
A-55-80-25-10	16.0	234 030	1131	10.1	392	4969	12.7	47	597	41
B-50-80-20-20	23.3	239 223	1226	9.9	384	5194	13.5	46	623	61
A-55-80-30-20	14.5	250 592	1169	10.5	406	5170	12.7	48	617	36
B-50-80-20-25	23.6	258 024	1288	10.4	404	5436	13.5	47	639	58
A-55-80-25-15	17.2	267 471	1219	11.0	425	5387	12.7	50	629	40
A-55-80-30-25	14.8	269 096	1218	10.9	422	5333	12.6	50	638	35
A-55-80-25-20	18.0	298 016	1295	11.6	450	5690	12.6	52	662	40
A-55-80-25-25	18.3	324 008	1354	12.2	471	5930	12.6	55	688	39
A-55-80-20-15[b]	20.6	330 095	1334	12.1	469	6018	12.8	55	704	44
A-50-80-30-25	15.3	334 396	1273	11.5	447	6066	13.6	55	748	34
A-50-80-25-15	18.5	344 294	1282	11.7	454	6187	13.6	56	758	41
A-55-80-20-20[b]	22.0	369 610	1423	12.9	500	6379	12.8	58	739	44
A-50-80-20-10	21.2	369 742	1295	12.0	464	6435	13.9	57	797	46
A-50-80-25-20	18.9	377 405	1357	12.5	482	6542	13.6	58	783	39
A-50-80-25-25	19.0	404 469	1417	13.0	502	6764	13.5	60	806	38
A-55-80-20-25[b]	22.7	404 596	1492	13.5	523	6654	12.7	61	774	43
A-50-80-20-15[b]	22.6	419 030	1401	13.0	503	6918	13.8	61	833	45
A-50-80-20-20[b]	23.3	463 457	1487	13.8	534	7301	13.7	63	868	44
A-45-80-25-25	19.4	482 601	1448	13.5	521	7336	14.1	66	926	37
A-50-80-20-25[b]	23.6	500 430	1560	14.4	558	7596	13.6	66	897	42
A-45-80-20-20	24.0	557 453	1523	14.4	555	7919	14.3	70	1,004	43
A-45-80-20-25	24.1	594 973	1592	14.9	578	8186	14.2	73	1,029	42

[a] 2013 USPSTF-recommended strategy.

[b] Six selected consensus-efficient 20 pack-year strategies.

Numbers are per a 100,000-person cohort followed from ages 45 to 90 years and are based on mean estimates across the four models. The screening programs are labeled as follows: frequency (A–annual and B–biennial)–age start–age stop–minimum pack-years–maximum years since quitting.

Abbreviations: LDCT=low-dose computed tomography; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force.

eTable 4. Harms of 57 Consensus-Efficient Risk Factor–Based Screening Programs Plus the 2013 USPSTF-Recommended Criteria Ordered by LDCT Screens—1960 Birth Cohort

Scenario	LDCT Screens	LDCT Scans	Mean LDCT Screens per Person Screened	Mean False-Positive Results per Person Screened	Biopsies	Overdiagnosed Cases	Overdiagnosis: % of All Lung Cancer Cases	Overdiagnosis: % of Screen-Detected Lung Cancer Cases	Radiation-Related Lung Cancer Deaths[c]
B-55-75-40-10	64 607	76 031	7.2	1.1	241	27	0.5	4.7	6.8
B-55-77-40-10	67 867	79 460	7.5	1.1	262	32	0.6	5.1	6.8
B-55-75-40-15	70 408	82 183	7.6	1.1	256	28	0.6	4.7	7.3
B-55-80-40-10	70 999	82 748	7.9	1.1	281	38	0.8	5.6	7.0
B-55-77-40-15	74 368	86 348	8.0	1.1	278	34	0.7	5.1	7.3
B-55-80-40-15	78 245	90 409	8.3	1.2	301	41	0.8	5.6	7.4
B-50-77-40-10	79 248	91 457	8.3	1.2	273	30	0.6	4.7	9.0
B-55-77-40-20	79 273	91 528	8.3	1.2	289	35	0.7	5.1	7.5
B-50-75-40-15	81 993	94 358	8.5	1.2	266	27	0.5	4.5	9.3
B-50-80-40-10	83 744	96 205	8.7	1.2	304	40	0.8	5.5	9.1
B-55-80-40-20	83 861	96 341	8.7	1.2	315	44	0.9	5.8	7.7
B-50-77-40-15	86 158	98 746	8.9	1.3	290	32	0.7	4.8	9.4
B-55-80-40-25	87 795	100 483	9.1	1.3	324	44	0.9	5.6	7.7
B-50-77-40-20	91 142	103 995	9.3	1.3	300	34	0.7	4.9	9.6
B-50-80-40-15	91 757	104 657	9.4	1.3	324	43	0.9	5.6	9.5
B-50-77-40-25	94 455	107 470	9.6	1.3	307	34	0.7	4.8	9.7
B-50-80-40-20	97 823	111 033	9.9	1.4	340	46	0.9	5.7	9.7
B-50-80-40-25	101 977	115 402	10.3	1.4	350	47	1.0	5.7	9.8
B-55-80-30-15	116 975	131 843	8.3	1.2	383	50	1.0	5.7	11.6
B-55-80-25-10	120 809	136 159	7.6	1.1	396	52	1.0	5.8	12.2
B-55-80-30-20	128 506	144 018	8.9	1.2	408	53	1.1	5.7	12.1
B-55-80-25-20	152 967	170 246	8.5	1.2	462	59	1.2	5.7	14.2
B-50-80-30-20	162 722	180 006	10.6	1.5	457	58	1.2	5.8	16.2
A-55-80-40-20	163 476	179 811	17.0	2.0	422	60	1.2	6.3	13.8
B-55-80-25-25	165 874	183 864	9.1	1.3	487	62	1.3	5.7	14.6
B-55-80-20-15	169 689	188 224	8.2	1.2	489	60	1.2	5.6	16.7
A-55-80-40-25	171 482	188 230	17.7	2.1	435	61	1.2	6.2	14.0
B-50-80-30-25	172 484	190 291	11.3	1.5	477	60	1.2	5.7	16.5
B-50-80-25-15	178 078	196 667	9.6	1.4	489	60	1.2	5.7	18.1
B-55-80-20-20	189 587	209 334	8.6	1.2	526	64	1.3	5.6	17.5
B-50-80-20-10	191 326	210 985	9.0	1.3	506	61	1.2	5.7	20.7
B-50-80-25-20	194 975	214 471	10.3	1.4	521	65	1.3	5.8	18.7
B-50-77-25-25	195 133	214 624	10.3	1.4	480	48	1.0	4.9	19.0
B-55-80-20-25	207 010	227 740	9.1	1.3	557	67	1.4	5.6	18.2
B-50-80-25-25	208 753	228 965	11.0	1.5	546	68	1.4	5.8	19.3
A-55-80-30-15[a]	227 443	247 644	16.1	1.9	518	69	1.4	6.3	20.6

Scenario	LDCT Screens	LDCT Scans	Mean LDCT Screens per Person Screened	Mean False-Positive Results per Person Screened	Biopsies	Overdiagnosed Cases	Overdiagnosis: % of All Lung Cancer Cases	Overdiagnosis: % of Screen-Detected Lung Cancer Cases	Radiation-Related Lung Cancer Deaths[c]
A-55-80-25-10	234 030	254 870	14.6	1.8	536	71	1.4	6.3	21.5
B-50-80-20-20	239 223	261 627	10.3	1.4	593	70	1.4	5.7	22.8
A-55-80-30-20	250 592	272 008	17.3	2.0	554	73	1.5	6.2	21.5
B-50-80-20-25	258 024	281 421	10.9	1.5	626	74	1.5	5.7	23.6
A-55-80-25-15	267 471	290 163	15.6	1.9	586	77	1.5	6.3	23.4
A-55-80-30-25	269 096	291 461	18.2	2.1	580	76	1.5	6.2	22.1
A-55-80-25-20	298 016	322 330	16.6	2.0	630	82	1.6	6.3	24.7
A-55-80-25-25	324 008	349 657	17.7	2.1	664	84	1.7	6.2	25.6
A-55-80-20-15[b]	330 095	356 390	16.0	1.9	667	83	1.7	6.2	29.0
A-50-80-30-25	334 396	359 972	21.9	2.5	639	76	1.5	6.0	29.9
A-50-80-25-15	344 294	370 892	18.6	2.2	658	77	1.6	6.0	32.1
A-55-80-20-20[b]	369 610	398 094	16.8	2.0	722	89	1.8	6.3	30.6
A-50-80-20-10	369 742	397 994	17.4	2.1	684	77	1.5	5.9	36.5
A-50-80-25-20	377 405	405 682	20.0	2.3	701	82	1.6	6.0	33.5
A-50-80-25-25	404 469	434 104	21.3	2.5	735	85	1.7	6.0	34.9
A-55-80-20-25[b]	404 596	434 892	17.8	2.1	765	94	1.9	6.3	31.9
A-50-80-20-15[b]	419 030	449 947	18.5	2.2	750	84	1.7	6.0	38.6
A-50-80-20-20[b]	463 457	496 698	19.9	2.3	804	89	1.8	6.0	40.6
A-45-80-25-25	482 601	515 967	24.9	2.8	797	86	1.7	5.9	45.8
A-50-80-20-25[b]	500 430	535 519	21.2	2.5	849	94	1.9	6.0	42.5
A-45-80-20-20	557 453	595 203	23.2	2.7	879	91	1.8	6.0	53.1
A-45-80-20-25	594 973	634 568	24.7	2.8	922	95	1.9	6.0	55.0

[a] 2013 USPSTF-recommended strategy.
[b] Six selected consensus-efficient 20 pack-year strategies.
[c] Mean of 2 models (MGH-HMS and UM).
Numbers are per a 100,000-person cohort followed from ages 45 to 90 years and are based on mean estimates across the four models. The screening programs are labeled as follows: frequency (A–annual and B–biennial)–age start–age stop–minimum pack-years–maximum years since quitting.
Abbreviations: LDCT=low-dose computed tomography; USPSTF=U.S. Preventive Services Task Force.

eTable 5. Benefits of 25 Selected[a] Consensus-Efficient Risk Factor–Based Screening Programs Plus the 2013 USPSTF-Recommended Criteria Ordered by LDCT Screens—1960 Birth Cohort; Mean and Range Across CISNET Models

Scenario	% Eligible	LDCT Screens	Screen-Detected Lung Cancer Cases	Lung Cancer Mortality Reduction (%)	Lung Cancer Deaths Averted	Life-Years Gained	Life-Years Gained per Lung Cancer Deaths Averted	LDCT Screens per Life-Years Gained	LDCT Screens per Lung Cancer Deaths Averted	NNS
B-55-80-20-20	22 (21.6, 22.4)	189 587 (187 469, 193 002)	1134 (350, 1634)	9 (4.8, 14.1)	348 (177, 516)	4490 (2649, 6032)	12.9 (11.7, 14.9)	42 (31, 72)	545 (365, 1068)	63 (42, 123)
B-55-80-20-25	22.7 (22.2, 23.1)	207 010 (204 167, 210 769)	1189 (370, 1722)	9.5 (5.1, 14.7)	366 (188, 536)	4701 (2829, 6222)	12.8 (11.6, 15)	44 (33, 73)	566 (383, 1092)	62 (42, 119)
B-50-80-25-25	19 (18.6, 19.4)	208 753 (205 300, 212 339)	1169 (324, 1701)	9.4 (5.1, 14.5)	363 (189, 529)	4859 (3009, 6362)	13.4 (12, 15.9)	43 (32, 69)	575 (391, 1086)	52 (36, 98)
A-55-80-30-15[b]	14.1 (13.8, 14.4)	227 443 (225 768, 230 480)	1102 (258, 1454)	9.8 (5.1, 16)	381 (188, 584)	4882 (2788, 6899)	12.8 (11.8, 14.8)	47 (33, 82)	597 (387, 1207)	37 (24, 73)
A-55-80-25-10	16 (15.7, 16.3)	234 030 (231 840, 237 539)	1131 (280, 1490)	10.1 (5.3, 16.4)	392 (196, 600)	4969 (2836, 7039)	12.7 (11.7, 14.5)	47 (33, 83)	597 (390, 1194)	41 (27, 80)
B-50-80-20-20	23.3 (22.8, 23.8)	239 223 (235 387, 243 378)	1226 (366, 1770)	9.9 (5.7, 15.3)	384 (211, 559)	5194 (3390, 6814)	13.5 (12.2, 16.1)	46 (35, 70)	623 (425, 1122)	61 (41, 109)
A-55-80-30-20	14.5 (14.2, 14.8)	250 592 (248 922, 254 015)	1169 (273, 1552)	10.5 (5.5, 16.8)	406 (203, 614)	5170 (3021, 7177)	12.7 (11.7, 14.9)	48 (35, 83)	617 (405, 1226)	36 (23, 70)
B-50-80-20-25	23.6 (23, 24)	258 024 (253 262, 262 523)	1288 (383, 1869)	10.4 (6, 15.9)	404 (222, 581)	5436 (3572, 7027)	13.5 (12.1, 16)	47 (36, 72)	639 (441, 1143)	58 (40, 104)
A-55-80-25-15	17.2 (16.9, 17.6)	267 471 (265 565, 271 399)	1219 (304, 1614)	11 (5.9, 17.6)	425 (217, 643)	5387 (3198, 7487)	12.7 (11.6, 14.7)	50 (36, 84)	629 (414, 1227)	40 (27, 78)
A-55-80-30-25	14.8 (14.4, 15.1)	269 096 (266 481, 272 914)	1218 (283, 1630)	10.9 (5.8, 17.4)	422 (212, 637)	5333 (3146, 7379)	12.6 (11.6, 14.8)	50 (36, 85)	638 (418, 1257)	35 (23, 68)
A-55-80-25-20	18 (17.5, 18.3)	298 016 (294 992, 302 450)	1295 (321, 1723)	11.6 (6.4 18.6)	450 (235, 679)	5690 (3485, 7834)	12.6 (11.5, 14.8)	52 (38, 85)	662 (437, 1259)	40 (26, 75)
A-55-80-25-25	18.3 (17.9, 18.7)	324 008 (319 778, 328 976)	1354 (336, 1812)	12.2 (6.7, 19.3)	471 (247, 706)	5930 (3672, 8091)	12.6 (11.5, 14.8)	55 (40, 88)	688 (455, 1297)	39 (26, 73)
A-55-80-20-15[c]	20.6 (20.3, 20.9)	330 095 (326 746, 335 324)	1334 (353, 1762)	12.1 (7, 19.2)	469 (257, 700)	6018 (3843, 8198)	12.8 (11.7, 14.9)	55 (40, 86)	704 (471, 1278)	44 (29, 79)
A-50-80-30-25	15.3 (14.9, 15.6)	334 396 (329 497, 339 808)	1273 (284, 1716)	11.5 (6.5, 18.2)	447 (239, 665)	6066 (3867, 8198)	13.6 (12.3, 16.2)	55 (40, 86)	748 (495, 1377)	34 (23, 62)
A-50-80-25-15	18.5 (18.1, 18.9)	344 294 (340 634, 349 670)	1282 (311, 1706)	11.7 (6.8, 18.5)	454 (249, 677)	6187 (4000, 8437)	13.6 (12.4, 16)	56 (41, 86)	758 (506, 1368)	41 (27, 73)
A-55-80-20-20[c]	22 (21.6, 22.4)	369 610 (364 985, 375 424)	1423 (375, 1890)	12.9 (7.5, 20.3)	500 (278, 740)	6379 (4177, 8,600)	12.8 (11.6, 15)	58 (43, 89)	739 (498, 1321)	44 (30, 78)
A-50-80-20-10	21.2 (20.9, 21.5)	369 742 (365 540, 375 831)	1295 (335, 1716)	12 (7.2, 18.8)	464 (267, 687)	6435 (4289, 8674)	13.9 (12.6, 16.1)	57 (43, 86)	797 (538, 1376)	46 (31, 79)
A-50-80-25-20	18.9 (18.5, 19.3)	377 405 (372 386, 383 356)	1357 (327, 1816)	12.5 (7.2, 19.4)	482 (267, 711)	6542 (4299, 8787)	13.6 (12.4, 16.1)	58 (43, 87)	783 (527, 1399)	39 (26, 69)

A-50-80-25-25	19 (18.6, 19.4)	404 469 (398 087, 411 019)	1417 (338, 1906)	13 (7.6, 20.2)	502 (279, 738)	6764 (4490, 9030)	13.5 (12.2, 16.1)	60 (44, 89)	806 (543, 1431)	38 (25, 67)
A-55-80-20-25[c]	22.7 (22.2, 23.1)	404 596 (398 475, 411 071)	1492 (394, 1996)	13.5 (8, 21.1)	523 (294, 772)	6654 (4426, 8907)	12.7 (11.5, 15)	61 (45, 91)	774 (522, 1362)	43 (29, 76)
A-50-80-20-15[c]	22.6 (22.2, 23)	419 030 (413 422, 425 782)	1401 (362, 1862)	13 (8, 20.2)	503 (294, 738)	6918 (4761, 9223)	13.8 (12.5, 16.2)	61 (45, 88)	833 (566, 1411)	45 (31, 76)
A-50-80-20-20[c]	23.3 (22.8, 23.8)	463 457 (456 067, 470 995)	1487 (382, 1990)	13.8 (8.5, 21.2)	534 (315, 776)	7301 (5129, 9627)	13.7 (12.4, 16.2)	63 (48, 90)	868 (594, 1453)	44 (30, 73)
A-45-80-25-25	19.4 (19, 19.8)	482 601 (473 409, 491 032)	1448 (340, 1955)	13.5 (8.2, 20.8)	521 (303, 760)	7336 (5164, 9571)	14.1 (12.6, 17)	66 (50, 92)	926 (627, 1565)	37 (25, 63)
A-50-80-20-25[c]	23.6 (23, 24)	500 430 (491 300, 508 669)	1560 (396, 2096)	14.4 (9, 22.1)	558 (331, 807)	7596 (5381, 9920)	13.6 (12.3, 16.3)	66 (50, 92)	897 (616, 1493)	42 (29, 70)
A-45-80-20-20	24 (23.5, 24.5)	557 453 (547 674, 566 689)	1523 (383, 2043)	14.4 (9.3, 21.8)	555 (345, 797)	7919 (5935, 10 162)	14.3 (12.7, 17.2)	70 (55, 93)	1004 (695, 1595)	43 (30, 69)
A-45-80-20-25	24.1 (23.5, 24.5)	594 973 (583 344, 604 931)	1592 (397, 2149)	14.9 (9.7, 22.7)	578 (359, 828)	8186 (6165, 10 463)	14.2 (12.6, 17.1)	73 (56, 95)	1029 (713, 1631)	42 (29, 66)

a Strategies with at least 9.0 percent lung cancer mortality reduction.
b 2013 USPSTF-recommended strategy.
c Six selected consensus-efficient 20 pack-year strategies.
Numbers are per a 100,000-person cohort followed from ages 45 to 90 years and are based on mean estimates across the four models. Each cell shows the mean and range (lowest and highest) estimate across the four CISNET models. The screening programs are labeled as follows: frequency (A–annual and B–biennial)–age start–age stop–minimum pack-years–maximum years since quitting.
Abbreviations: LDCT=low-dose computed tomography; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force.

eTable 6. Harms of 25 Selected[a] Consensus-Efficient Risk Factor–Based Screening Programs Plus the 2013 USPSTF-Recommended Criteria Ordered by LDCT Screens—1960 Birth Cohort; Mean and Range Across CISNET Models

Scenario	LDCT Screens	LDCT Scans	Mean LDCT Screens per Person Screened	Mean False-Positive Results per Person Screened	Biopsies	Overdiag-nosed Cases	Overdiag-nosis: % of All Lung Cancer Cases	Overdiag-nosis: % of Screen-Detected Lung Cancer Cases	Radiation-Related Lung Cancer Deaths[d]
B-55-80-20-20	189 587 (187 469, 193 002)	209 334 (201 862, 220 551)	8.6 (8.6, 8.7)	1.2 (0.5, 2.2)	526 (396, 606)	64 (31, 85)	1.3 (0.6, 1.7)	5.6 (4.4, 8.9)	17.5 (12.8, 22.2)
B-55-80-20-25	207 010 (204 167, 210 769)	227 740 (220 307, 237 455)	9.1 (9.1, 9.2)	1.3 (0.6, 2.3)	557 (421, 641)	67 (32, 88)	1.4 (0.6, 1.8)	5.6 (4.5, 8.7)	18.2 (13.9, 22.5)
B-50-80-25-25	208 753 (205 300, 212 339)	228 965 (221 702, 237 530)	11 (10.9, 11.1)	1.5 (0.6, 2.6)	546 (399, 634)	68 (28, 92)	1.4 (0.5, 1.9)	5.8 (4.6, 8.6)	19.3 (14.4, 24.2)
A-55-80-30-15[b]	227 443 (225 768, 230 480)	247 644 (239 774, 257 540)	16.1 (15.9, 16.5)	1.9 (0.9, 3.1)	518 (336, 658)	69 (29, 101)	1.4 (0.6, 2.1)	6.3 (5, 11.2)	20.6 (15.3, 25.8)
A-55-80-25-10	234 030 (231 840, 237 539)	254 870 (246 460, 264 329)	14.6 (14.6, 14.8)	1.8 (0.8, 2.9)	536 (360, 677)	71 (30, 105)	1.4 (0.6, 2.2)	6.3 (5, 10.8)	21.5 (15.7, 27.3)
B-50-80-20-20	239 223 (235 387, 243 378)	261 627 (254 111, 268 764)	10.3 (10.2, 10.3)	1.4 (0.6, 2.6)	593 (467, 689)	70 (32, 95)	1.4 (0.6, 2)	5.7 (4.4, 8.8)	22.8 (16.6, 29)
A-55-80-30-20	250 592 (248 922, 254 015)	272 008 (264 192, 279 882)	17.3 (17.1, 17.6)	2 (1, 3.2)	554 (357, 701)	73 (32, 106)	1.5 (0.6, 2.2)	6.2 (5.1, 11.5)	21.5 (16.6, 26.3)
B-50-80-20-25	258 024 (253 262, 262 523)	281 421 (273 995, 287 279)	10.9 (10.9, 11)	1.5 (0.7, 2.7)	626 (490, 724)	74 (33, 99)	1.5 (0.6, 2)	5.7 (4.5, 8.7)	23.6 (17.7, 29.5)
A-55-80-25-15	267 471 (265 565, 271 399)	290 163 (282 372, 298 333)	15.6 (15.4, 15.7)	1.9 (0.9, 3)	586 (398, 743)	77 (32, 113)	1.5 (0.6, 2.3)	6.3 (5.1, 10.7)	23.4 (17.8, 29.1)
A-55-80-30-25	269 096 (266 481, 272 914)	291 461 (283 790, 297 939)	18.2 (18.1, 18.6)	2.1 (1, 3.3)	580 (373, 735)	76 (32, 110)	1.5 (0.6, 2.3)	6.2 (5.2, 11.4)	22.1 (17.6, 26.6)
A-55-80-25-20	298 016 (294 992, 302 450)	322 330 (314 570, 331 529)	16.6 (16.5, 16.8)	2 (0.9, 3.1)	630 (429, 798)	82 (36, 119)	1.6 (0.7, 2.4)	6.3 (5.1, 11.1)	24.7 (19.6, 29.8)
A-55-80-25-25	324 008 (319 778, 328 976)	349 657 (342 030, 359 416)	17.7 (17.5, 17.9)	2.1 (1, 3.2)	664 (451, 842)	84 (37, 123)	1.7 (0.7, 2.5)	6.2 (4.9, 10.9)	25.6 (21, 30.2)
A-55-80-20-15[c]	330 095 (326 746, 335 324)	356 390 (348 621, 368 653)	16 (16, 16.2)	1.9 (0.9, 3)	667 (480, 848)	83 (38, 121)	1.7 (0.7, 2.5)	6.2 (4.9, 10.8)	29 (22, 36)
A-50-80-30-25	334 396 (329 497, 339 808)	359 972 (352 943, 368 506)	21.9 (21.7, 22.1)	2.5 (1.2, 3.8)	639 (433, 817)	76 (33, 109)	1.5 (0.6, 2.2)	6 (4.8, 11.6)	29.9 (23, 36.8)
A-50-80-25-15	344 294 (340 634, 349 670)	370 892 (363 381, 383 048)	18.6 (18.4, 18.8)	2.2 (1.1, 3.5)	658 (479, 840)	77 (34, 111)	1.6 (0.7, 2.3)	6 (4.9, 10.9)	32.1 (24.1, 40.2)
A-55-80-20-20[c]	369 610 (364 985, 375 424)	398 094 (390 275, 412 147)	16.8 (16.8, 17)	2 (1, 3.1)	722 (523, 917)	89 (42, 127)	1.8 (0.8, 2.6)	6.3 (5.1, 11.2)	30.6 (24.3, 37)
A-50-80-20-10	369 742 (365 540, 375 831)	397 994 (390 503, 412 275)	17.4 (17.4, 17.5)	2.1 (1, 3.3)	684 (525, 873)	77 (37, 111)	1.5 (0.7, 2.3)	5.9 (4.8, 11.1)	36.5 (26.1, 47)

Scenario	LDCT Screens	LDCT Scans	Mean LDCT Screens per Person Screened	Mean False-Positive Results per Person Screened	Biopsies	Overdiag-nosed Cases	Overdiag-nosis: % of All Lung Cancer Cases	Overdiag-nosis: % of Screen-Detected Lung Cancer Cases	Radiation-Related Lung Cancer Deaths[d]
A-50-80-25-20	377 405 (372 386, 383 356)	405 682 (398 226, 418 755)	20 (19.8, 20.2)	2.3 (1.1, 3.6)	701 (508, 897)	82 (36, 117)	1.6 (0.7, 2.4)	6 (4.9, 11.1)	33.5 (26.1, 40.9)
A-50-80-25-25	404 469 (398 087, 411 019)	434 104 (426 897, 447 570)	21.3 (21.1, 21.5)	2.5 (1.2, 3.8)	735 (527, 942)	85 (37, 121)	1.7 (0.7, 2.5)	6 (4.9, 11)	34.9 (27.6, 42.1)
A-55-80-20-25[c]	404 596 (398 475, 411 071)	434 892 (427 122, 449 985)	17.8 (17.8, 18)	2.1 (1, 3.2)	765 (556, 973)	94 (43, 132)	1.9 (0.8, 2.7)	6.3 (5.1, 11)	31.9 (26.2, 37.6)
A-50-80-20-15[c]	419 030 (413 422, 425 782)	449 947 (442 335, 466 558)	18.5 (18.5, 18.6)	2.2 (1, 3.5)	750 (578, 959)	84 (40, 119)	1.7 (0.8, 2.4)	6 (4.8, 11.1)	38.6 (29.2, 48)
A-50-80-20-20[c]	463 457 (456 067, 470 995)	496 698 (489 237, 514 727)	19.9 (19.8, 20)	2.3 (1.1, 3.6)	804 (619, 1031)	89 (43, 125)	1.8 (0.8, 2.6)	6 (4.9, 11.3)	40.6 (31.9, 49.3)
A-45-80-25-25	482 601 (473 409, 491 032)	515 967 (505 095, 531 931)	24.9 (24.7, 25)	2.8 (1.4, 4.4)	797 (610, 1025)	86 (39, 123)	1.7 (0.8, 2.5)	5.9 (4.7, 11.5)	45.8 (34.1, 57.6)
A-50-80-20-25[c]	500 430 (491 300, 508 669)	535 519 (524 554, 554 368)	21.2 (21.2, 21.4)	2.5 (1.2, 3.8)	849 (647, 1088)	94 (45, 130)	1.9 (0.9, 2.7)	6 (4.9, 11.3)	42.5 (34, 51)
A-45-80-20-20	557 453 (547 674, 566 689)	595 203 (580 476, 617 835)	23.2 (23.1, 23.4)	2.7 (1.3, 4.2)	879 (721, 1132)	91 (45, 127)	1.8 (0.9, 2.6)	6 (4.8, 11.7)	53.1 (39.5, 66.8)
A-45-80-20-25	594 973 (583 344, 604 931)	634 568 (616 172, 657 897)	24.7 (24.6, 24.8)	2.8 (1.4, 4.4)	922 (748, 1189)	95 (46, 132)	1.9 (0.9, 2.7)	6 (4.8, 11.6)	55 (41.7, 68.4)

[a] Strategies with at least 9.0% lung cancer mortality reduction.
[b] 2013 USPSTF-recommended strategy.
[c] Six selected consensus-efficient 20 pack-year strategies.
[d] Mean of 2 models (MGH-HMS and UM).
Numbers are per a 100,000-person cohort followed from ages 45 to 90 years and are based on mean estimates across the four models. Each cell shows the mean and range (lowest and highest) estimate across the four CISNET models. The screening programs are labeled as follows: frequency (A–annual and B–biennial)–age start–age stop–minimum pack-years–maximum years since quitting.
Abbreviations: LDCT=low-dose computed tomography; MGH-HMS=Massachusetts General Hospital–Harvard Medical School; USPSTF=U.S. Preventive Services Task Force.

eTable 7. Comparison of 2013 USPSTF-Recommended (A-55-80-30-15) and Selected Risk Factor–Based Screening (20 Pack-Year Consensus-Efficient) Scenarios—1960 Birth Cohort

	A-55-80-30-15	A-55-80-20-15	A-55-80-20-20	A-55-80-20-25	A-50-80-20-15	A-50-80-20-20	A-50-80-20-25
% eligible	14.1%	20.6%	22.0%	22.7%	22.6%	23.3%	23.6%
# LDCT screens[a]	227,443	330,095	369,610	404,596	419,030	463,457	500,430
Mean # of LDCT screens per person screened	16.1	16.0	16.8	17.8	18.5	19.9	21.2
Mean age at first screen	56.2	55.7	55.6	55.6	51.5	51.5	51.5
Mean age at last screen	71.3	70.7	71.4	72.5	69.0	70.3	71.6
Mean age at screening	65.1	65.1	65.3	65.5	59.0	59.4	59.9
Lung cancer deaths averted[a]	381	469	500	523	503	534	558
Mortality reduction	9.8%	12.1%	12.9%	13.5%	13.0%	13.8%	14.4%
Difference in lung cancer deaths averted vs. USPSTF strategy	NA	23.1%	31.2%	37.3%	32.0%	40.2%	46.5%
Mean # screens per lung cancer death averted	597	704	739	774	833	868	897
Life-years gained[a]	4,882	6,018	6,379	6,654	6,918	7,301	7,596
Difference in life-years gained vs. USPSTF strategy	NA	23.3%	30.7%	36.3%	41.7%	49.5%	55.6%
Mean # screens per life-years gained	47	55	58	61	61	63	66
NNS	37	44	44	43	45	44	42
False-positive screens per person screened	1.9	1.9	2.0	2.1	2.2	2.3	2.5
Biopsies	518	667	722	765	750	804	849
Overdiagnosed cases[a]	69	83	89	94	84	89	94
Overdiagnosis rate per screen-detected cancers	6.3%	6.2%	6.3%	6.3%	6.0%	6.0%	6.0%
Radiation-related lung cancer deaths[a]	20.6	29.0	30.6	31.9	38.6	40.6	42.5

[a] Per 100 000 individuals. The screening programs are labeled as follows: frequency (A–annual and B–biennial)–age start–age stop–minimum pack-years–maximum years since quitting.

Abbreviations: LDCT=low-dose computed tomography; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force.

eTable 8. Comparison of 2013 USPSTF-Recommended (A-55-80-30-15) and Selected Risk Factor–Based Screening (20 Pack-Year Consensus-Efficient) Scenarios—1960 Birth Cohort Men

Outcome	A-55-80-30-15	A-55-80-20-15	A-55-80-20-20	A-55-80-20-25	A-50-80-20-15	A-50-80-20-20	A-50-80-20-25
% eligible	15.7%	21.8%	23.5%	24.4%	24.4%	25.3%	25.6%
# LDCT screens[a]	250 071	338 814	380 919	419 641	438 248	486 445	527 801
Mean # of LDCT screens per person screened	15.9	15.5	16.2	17.2	18.0	19.2	20.6
Mean age at first screen	55.9	55.6	55.5	55.5	51.2	51.2	51.2
Mean age at last screen	70.6	70.0	70.6	71.6	68.1	69.3	70.7
Mean age at screening	64.8	64.9	65.0	65.2	58.5	58.9	59.4
Lung cancer deaths averted[a]	400	475	505	526	513	542	565
Mortality reduction	10.0%	11.8%	12.6%	13.1%	12.8%	13.5%	14.1%
Difference in lung cancer deaths averted vs. USPSTF strategy	NA	18.8%	26.2%	31.5%	28.2%	35.5%	41.2%
Mean # screens per lung cancer deaths averted	625	713	754	798	854	898	934
Life-years gained[a]	5078	6022	6396	6664	7031	7397	7696
Difference in life-years gained vs. USPSTF strategy	NA	18.6%	26.0%	31.2%	38.5%	45.7%	51.6%
Mean # screens per life-years gained	49	56	60	63	62	66	69
NNS	39	46	47	46	48	47	45
False-positive screens per person screened	1.9	1.9	1.9	2.0	2.1	2.3	2.4
Biopsies	569	701	757	804	796	854	902
Overdiagnosed cases[a]	74	85	92	96	87	92	97
Overdiagnosis rate per screen-detected cancers	6.1%	6.0%	6.1%	6.1%	5.8%	5.8%	5.9%
Radiation-related lung cancer deaths[a]	19.2	25.5	27.0	28.0	34.8	36.6	38.3

[a] Per 100,000 individuals.

Abbreviations: LDCT=low-dose computed tomography; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force; vs.=versus.

eTable 9. Comparison of 2013 USPSTF-Recommended (A-55-80-30-15) and Selected Risk Factor–Based Screening (20 Pack-Year Consensus-Efficient) Scenarios—1960 Birth Cohort Women

Outcome	A-55-80-30-15	A-55-80-20-15	A-55-80-20-20	A-55-80-20-25	A-50-80-20-15	A-50-80-20-20	A-50-80-20-25
% eligible	12.4%	19.3%	20.4%	20.9%	20.9%	21.4%	21.5%
# LDCT screens[a]	204 815	321 376	358 302	389 551	399 813	440 469	473 059
Mean # of LDCT screens per person screened	16.5	16.7	17.6	18.6	19.1	20.6	22.0
Mean age at first screen	56.7	55.8	55.8	55.8	51.9	51.8	51.8
Mean age at last screen	72.1	71.5	72.3	73.4	70.0	71.4	72.7
Mean age at screening	65.4	65.4	65.6	65.9	59.5	60.0	60.5
Lung cancer deaths averted[a]	362	463	495	520	492	526	551
Mortality reduction	9.7%	12.4%	13.2%	13.9%	13.2%	14.1%	14.7%
Difference in lung cancer deaths averted vs. USPSTF strategy	NA	27.9%	36.7%	43.6%	35.9%	45.3%	52.2%
Mean # screens per lung cancer deaths averted	566	694	724	749	813	837	859
Life-years gained[a]	4685	6014	6363	6645	6805	7205	7496
Difference in life-years gained vs. USPSTF strategy	NA	28.4%	35.8%	41.8%	45.3%	53.8%	60.0%
Mean # screens per life-years gained	44	53	56	59	59	61	63
NNS	34	42	41	40	42	41	39
False-positive screens per person screened	2.0	2.0	2.1	2.2	2.3	2.4	2.5
Biopsies	467	633	686	726	703	754	796
Overdiagnosed cases[a]	64	80	87	91	82	86	90
Overdiagnosis rate per screen-detected cancers	6.4%	6.4%	6.5%	6.4%	6.3%	6.2%	6.2%
Radiation-related lung cancer deaths[a]	22.0	32.4	34.2	35.8	42.4	44.6	46.7

[a] Per 100,000 individuals.

Abbreviations: LDCT=low-dose computed tomography; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force; vs.=versus.

eTable 10. Screening Eligibility in the United States and Proportional Distribution of 100,000 LDCT Screens by Sex According to the 2015 National Health Interview Survey

Scenario		Men	Women	Total
2013 USPSTF (A-55-80-30-15)	Number eligible	4 691 054	3 414 939	8 095 274
	Percentage eligible[a]	4.2%	2.8%	3.5%
	Number of LDCTs	57 546	42 454	100 000
	Percentage of LDCTs	57.5%	42.5%	100.0%
A-55-80-20-15	Number eligible	6 400 415	5 321 359	11 711 857
	Percentage eligible[a]	5.7%	4.4%	5.0%
	Number of LDCTs	54 287	45 713	100 000
	Percentage of LDCTs	54.3%	45.7%	100.0%
A-55-80-20-20	Number eligible	7 488 322	5 818 536	13 286 967
	Percentage eligible[a]	6.7%	4.8%	5.7%
	Number of LDCTs	55 831	44 169	100 000
	Percentage of LDCTs	55.8%	44.2%	100.0%
A-55-80-20-25	Number eligible	8 143 360	6 292 519	14 411 807
	Percentage eligible[a]	7.3%	5.2%	6.2%
	Number of LDCTs	55 924	44 076	100 000
	Percentage of LDCTs	55.9%	44.1%	100.0%
A-50-80-20-15	Number eligible	8 460 913	6 698 602	15 136 661
	Percentage eligible[a]	7.6%	5.5%	6.5%
	Number of LDCTs	55 338	44 662	100 000
	Percentage of LDCTs	55.3%	44.7%	100.0%
A-50-80-20-20	Number eligible	9 629 964	7 255 481	16 847 872
	Percentage eligible[a]	8.6%	6.0%	7.2%
	Number of LDCTs	56 428	43 572	100 000
	Percentage of LDCTs	56.4%	43.6%	100.0%
A-50-80-20-25	Number eligible	10 318 296	7 756 939	18 031 876
	Percentage eligible[a]	9.2%	6.4%	7.7%
	Number of LDCTs	56 439	43 561	100 000
	Percentage of LDCTs	56.4%	43.6%	100.0%

[a] Of adults ages 18+.

Abbreviation: LDCT=low-dose computed tomography; USPSTF=U.S. Preventive Services Task Force.

eTable 11. Screening Eligibility in the United States and Proportional Distribution of 100,000 LDCT Screens by Race/Ethnicity According to the 2015 National Health Interview Survey

Scenario		NHW	NHB	Hispanic	Asian	AI/AN	Total
2013 USPSTF (A-55-80-30-15)	Number eligible	6 808 288	534 109	283 030	157 602	43 201	8 095 274
	Percentage eligible[a]	4.5%	1.9%	0.8%	1.2%	2.5%	3.5%
	Number of LDCTs	87 003	6815	3618	2012	552	100 000
	Percentage of LDCTs	87.0%	6.8%	3.6%	2.0%	0.6%	100%
A-55-80-20-15	Number eligible	9 449 171	952 962	463 140	221 459	63 832	11 711 857
	Percentage eligible[a]	6.2%	3.4%	1.3%	1.6%	3.6%	5.0%
	Number of LDCTs	84 730	8548	4162	1988	573	100 000
	Percentage of LDCTs	84.7%	8.5%	4.2%	2.0%	0.6%	100%
A-55-80-20-20	Number eligible	10 685 654	1 028 862	558 708	237 762	63 832	13 286 967
	Percentage eligible[a]	7.0%	3.7%	1.5%	1.8%	3.6%	5.7%
	Number of LDCTs	84 960	8192	4448	1892	508	100 000
	Percentage of LDCTs	85.0%	8.2%	4.4%	1.9%	0.5%	100%
A-55-80-20-25	Number eligible	11 555 772	1 082 273	610 168	254 066	69 298	14 411 807
	Percentage eligible[a]	7.6%	3.9%	1.7%	1.9%	3.9%	6.2%
	Number of LDCTs	85 139	7977	4500	1874	510	100 000
	Percentage of LDCTs	85.1%	8.0%	4.5%	1.9%	0.5%	100%
A-50-80-20-15	Number eligible	12 135 850	1 104 761	599 141	254 066	115 496	15 136 661
	Percentage eligible[a]	8.0%	3.9%	1.6%	1.9%	6.6%	6.5%
	Number of LDCTs	85 416	7780	4207	1784	813	100 000
	Percentage of LDCTs	85.4%	7.8%	4.2%	1.8%	0.8%	100%
A-50-80-20-20	Number eligible	13 418 128	1 191 905	713 088	270 370	115 496	16 847 872
	Percentage eligible[a]	8.8%	4.2%	1.9%	2.0%	6.6%	7.2%
	Number of LDCTs	85 429	7582	4537	1717	735	100 000
	Percentage of LDCTs	85.4%	7.6%	4.5%	1.7%	0.7%	100%
A-50-80-20-25	Number eligible	14 318 776	1 245 316	771 899	286 673	120 963	18 031 876
	Percentage eligible[a]	9.4%	4.4%	2.1%	2.1%	6.9%	7.7%
	Number of LDCTs	85 531	7434	4602	1710	722	100 000
	Percentage of LDCTs	85.5%	7.4%	4.6%	1.7%	0.7%	100%

[a] Of adults ages 18+.

Abbreviations: AI/AN=American Indian and Alaska Native; LDCT=low-dose computed tomography; NHB=non-Hispanic black; NHW=non-Hispanic white; USPSTF=U.S. Preventive Services Task Force.

eTable 12. Benefits of 144 Selected[a] Consensus-Efficient Risk Model–Based or Risk Factor–Based Screening Programs Plus the 2013 USPSTF-Recommended Criteria and Six Selected 20 Pack-Year Scenarios Ordered by LDCT Screens—1960 Birth Cohort

Scenario	% Eligible	LDCT Screens	Screen-Detected Lung Cancer Cases	Lung Cancer Mortality Reduction (%)	Lung Cancer Deaths Averted	Life-Years Gained	Life-Years Gained per Lung Cancer Deaths Averted	LDCT Screens per Life-Years Gained	LDCT Screens per Lung Cancer Death Averted	NNS
B-50-80-MLCDRAT-0.015	20.7	148 360	1174	9.0	348	3940	11.3	38	426	59
B-50-80-Bach-0.025	21.6	150 601	1197	9.2	355	4017	11.3	37	424	61
B-50-80-MPLCOm2012-0.014	19.7	153 324	1187	9.2	356	4147	11.6	37	431	55
B-55-80-Bach-0.024	22.0	154 299	1190	9.1	354	4056	11.5	38	436	62
B-50-80-Bach-0.024	22.2	157 520	1222	9.4	362	4125	11.4	38	435	61
B-55-80-MPLCOm2012-0.013	20.4	158 123	1181	9.1	354	4177	11.8	38	447	58
B-50-80-MLCDRAT-0.014	21.6	158 658	1206	9.3	361	4106	11.4	39	439	60
B-50-80-MPLCOm2012-0.013	20.6	164 259	1218	9.5	367	4348	11.8	38	448	56
B-50-80-Bach-0.023	22.7	164 603	1242	9.5	370	4239	11.5	39	445	61
B-50-80-Bach-0.022	23.3	172 049	1262	9.7	377	4365	11.6	39	456	62
A-55-80-MPLCOm2012-0.023	14.3	174 860	1177	10.0	388	4161	10.7	42	451	37
A-50-80-MPLCOm2012-0.023	14.3	174 911	1178	10.0	388	4187	10.8	42	451	37
B-55-80-Bach-0.021	23.8	175 310	1245	9.6	372	4325	11.6	41	471	64
B-50-80-MPLCOm2012-0.012	21.6	176 755	1253	9.7	378	4527	12.0	39	468	57
A-55-80-MLCDRAT-0.023	15.6	179 310	1178	10.0	388	4087	10.5	44	462	40
B-50-80-Bach-0.021	23.9	180 105	1280	9.9	384	4457	11.6	40	469	62
B-55-80-Bach-0.02	24.4	182 833	1264	9.8	381	4439	11.7	41	480	64
A-55-80-MPLCOm2012-0.022	14.7	184 176	1204	10.3	400	4334	10.8	42	460	37
A-50-80-MPLCOm2012-0.022	14.7	184 284	1205	10.3	399	4336	10.9	43	462	37
B-50-80-Bach-0.02	24.6	188 573	1301	10.2	394	4596	11.7	41	479	62
B-55-80-Bach-0.019	25.0	190 612	1282	10.0	387	4547	11.7	42	493	65
B-50-80-MPLCOm2012-0.011	22.7	191 379	1290	10.1	393	4766	12.1	40	487	58
A-55-80-MPLCOm2012-0.021	15.3	193 965	1232	10.6	411	4515	11.0	43	472	37
A-55-80-Bach-0.034	17.1	194 099	1247	10.6	409	4404	10.8	44	475	42
A-50-80-MPLCOm2012-0.021	15.3	194 193	1235	10.6	410	4502	11.0	43	474	37
A-50-80-Bach-0.034	17.1	194 261	1248	10.6	411	4417	10.7	44	473	42
B-50-80-Bach-0.019	25.2	197 209	1323	10.3	400	4727	11.8	42	493	63
A-55-80-Bach-0.033	17.5	202 943	1272	10.8	420	4539	10.8	45	483	42
A-50-80-Bach-0.033	17.5	203 167	1271	10.8	419	4526	10.8	45	485	42
A-55-80-MPLCOm2012-0.02	15.8	204 612	1262	10.9	421	4645	11.0	44	486	38
A-50-80-MPLCOm2012-0.02	15.8	205 020	1262	10.8	419	4662	11.1	44	489	38
B-50-80-Bach-0.018	25.8	206 581	1343	10.5	408	4830	11.8	43	506	63
B-50-80-MPLCOm2012-0.01	23.8	206 957	1323	10.4	404	4967	12.3	42	512	59
A-50-80-MLCDRAT-0.02	17.4	210 560	1273	10.9	423	4566	10.8	46	498	41

Scenario	% Eligible	LDCT Screens	Screen-Detected Lung Cancer Cases	Lung Cancer Mortality Reduction (%)	Lung Cancer Deaths Averted	Life-Years Gained	Life-Years Gained per Lung Cancer Deaths Averted	LDCT Screens per Life-Years Gained	LDCT Screens per Lung Cancer Death Averted	NNS
A-55-80-Bach-0.032	18.0	212 181	1296	11.1	431	4655	10.8	46	492	42
A-50-80-Bach-0.032	18.0	212 490	1298	11.1	430	4668	10.9	46	494	42
A-55-80-MPLCOm2012-0.019	16.3	216 291	1293	11.2	434	4833	11.1	45	498	38
A-50-80-MPLCOm2012-0.019	16.4	217 030	1293	11.2	435	4859	11.2	45	499	38
A-55-80-Bach-0.031	18.5	221 421	1321	11.3	439	4791	10.9	46	504	42
A-50-80-Bach-0.031	18.5	221 847	1321	11.4	441	4831	11.0	46	503	42
B-50-80-MPLCOm2012-0.009	25.0	225 054	1357	10.8	417	5169	12.4	44	540	60
A-50-80-MLCDRAT-0.019	18.1	225 292	1310	11.3	437	4774	10.9	47	516	41
B-50-80-Bach-0.016	27.3	227 395	1388	10.9	423	5099	12.1	45	538	65
A-55-80-30-15[b]	14.1	227 443	1102	9.8	381	4882	12.8	47	597	37
A-55-80-MPLCOm2012-0.018	17.0	228 676	1320	11.5	444	4982	11.2	46	515	38
A-50-80-MPLCOm2012-0.018	17.0	229 944	1327	11.5	445	5021	11.3	46	517	38
A-55-80-Bach-0.03	19.0	231 518	1347	11.6	450	4936	11.0	47	514	42
A-50-80-Bach-0.03	19.0	232 092	1350	11.6	450	4969	11.0	47	516	42
A-50-80-MLCDRAT-0.018	18.6	236 479	1339	11.6	450	4942	11.0	48	526	41
A-55-80-MLCDRAT-0.018	18.6	236 483	1340	11.5	448	4916	11.0	48	528	42
A-55-80-Bach-0.029	19.5	241 484	1370	11.8	459	5063	11.0	48	526	42
A-50-80-Bach-0.029	19.5	242 278	1374	11.8	459	5084	11.1	48	528	42
A-55-80-MPLCOm2012-0.017	17.6	242 329	1352	11.8	455	5163	11.3	47	533	39
A-50-80-MPLCOm2012-0.017	17.6	244 349	1359	11.8	457	5227	11.4	47	535	39
B-50-80-MPLCOm2012-0.008	26.5	245 777	1399	11.2	432	5407	12.5	45	569	61
B-50-80-Bach-0.014	28.8	250 390	1430	11.3	438	5358	12.2	47	572	66
A-55-80-Bach-0.028	20.0	252 590	1396	12.1	468	5199	11.1	49	540	43
A-50-80-Bach-0.028	20.0	253 613	1399	12.1	471	5225	11.1	49	538	42
A-50-80-MLCDRAT-0.017	19.3	253 620	1376	12.0	463	5153	11.1	49	548	42
A-55-80-MPLCOm2012-0.016	18.3	256 724	1383	12.1	468	5341	11.4	48	549	39
A-50-80-MPLCOm2012-0.016	18.3	259 832	1394	12.3	475	5502	11.6	47	547	39
B-50-80-Bach-0.013	29.6	263 135	1451	11.5	445	5498	12.4	48	591	67
A-55-80-Bach-0.027	20.6	263 986	1420	12.3	478	5328	11.1	50	552	43
A-50-80-Bach-0.027	20.6	265 411	1424	12.3	478	5353	11.2	50	555	43
A-50-80-MLCDRAT-0.016	20.0	267 426	1409	12.3	478	5355	11.2	50	559	42
B-50-80-MPLCOm2012-0.007	28.1	270 148	1442	11.6	449	5644	12.6	48	602	63
A-55-80-MPLCOm2012-0.015	19.0	272 809	1415	12.4	481	5533	11.5	49	567	40
A-55-80-Bach-0.026	21.1	275 329	1444	12.6	489	5463	11.2	50	563	43
B-50-80-Bach-0.012	30.5	277 033	1476	11.8	456	5639	12.4	49	608	67
A-50-80-Bach-0.026	21.1	277 066	1447	12.6	489	5495	11.2	50	567	43
A-50-80-MPLCOm2012-0.015	19.0	277 426	1429	12.6	488	5685	11.6	49	568	39

Scenario	% Eligible	LDCT Screens	Screen-Detected Lung Cancer Cases	Lung Cancer Mortality Reduction (%)	Lung Cancer Deaths Averted	Life-Years Gained	Life-Years Gained per Lung Cancer Deaths Averted	LDCT Screens per Life-Years Gained	LDCT Screens per Lung Cancer Death Averted	NNS
A-50-77-MPLCOm2012-0.013	19.7	280 113	1260	11.4	441	5712	13.0	49	635	45
A-50-80-MLCDRAT-0.015	20.8	286 154	1451	12.7	491	5562	11.3	51	583	42
A-55-80-Bach-0.025	21.7	287 935	1470	12.8	495	5572	11.3	52	582	44
A-50-80-Bach-0.025	21.7	290 340	1475	12.9	498	5657	11.4	51	583	44
A-55-80-MPLCOm2012-0.014	19.8	290 431	1452	12.7	494	5717	11.6	51	588	40
B-50-80-Bach-0.011	31.5	292 128	1499	12.0	465	5800	12.5	50	628	68
B-50-80-MPLCOm2012-0.006	29.9	296 680	1482	11.9	461	5867	12.7	51	644	65
A-50-80-MPLCOm2012-0.014	19.8	297 009	1466	13.0	503	5925	11.8	50	590	39
A-55-80-Bach-0.024	22.2	300 842	1494	13.1	507	5735	11.3	52	593	44
A-50-77-MPLCOm2012-0.012	20.6	303 023	1296	11.7	455	5960	13.1	51	666	45
A-55-80-MLCDRAT-0.014	21.7	303 286	1480	13.0	504	5722	11.4	53	602	43
A-50-80-Bach-0.024	22.3	303 778	1502	13.2	510	5840	11.5	52	596	44
A-50-80-MLCDRAT-0.014	21.7	306 138	1487	13.1	507	5808	11.5	53	604	43
B-50-80-Bach-0.01	32.6	308 091	1527	12.2	472	5924	12.6	52	653	69
A-55-80-MPLCOm2012-0.013	20.6	309 284	1482	13.1	508	5933	11.7	52	609	41
A-55-80-Bach-0.023	22.8	313 914	1520	13.4	518	5898	11.4	53	606	44
A-50-80-Bach-0.023	22.9	317 678	1530	13.4	521	5999	11.5	53	610	44
A-50-80-MPLCOm2012-0.013	20.7	318 502	1502	13.3	514	6136	11.9	52	620	40
A-55-80-MLCDRAT-0.013	22.6	320 862	1516	13.4	520	5935	11.4	54	617	43
A-50-80-MLCDRAT-0.013	22.7	325 175	1524	13.5	522	6033	11.6	54	623	43
B-50-80-Bach-0.009	33.8	325 901	1554	12.5	484	6136	12.7	53	673	70
B-50-80-MPLCOm2012-0.005	31.9	327 272	1522	12.3	477	6149	12.9	53	686	67
A-55-80-Bach-0.022	23.4	327 719	1542	13.6	527	6024	11.4	54	622	44
A-50-77-MPLCOm2012-0.011	21.6	328 622	1331	12.1	469	6212	13.2	53	701	46
A-55-80-20-15[c]	20.6	330 095	1334	12.1	469	6018	12.8	55	704	44
A-55-80-MPLCOm2012-0.012	21.6	330 347	1519	13.4	520	6146	11.8	54	635	42
A-50-80-Bach-0.022	23.4	332 451	1550	13.7	531	6167	11.6	54	626	44
A-55-80-Bach-0.021	24.0	342 337	1566	13.9	538	6197	11.5	55	636	45
A-50-80-MPLCOm2012-0.012	21.7	343 293	1543	13.7	532	6409	12.0	54	645	41
A-55-80-MLCDRAT-0.012	23.8	343 713	1551	13.7	532	6126	11.5	56	646	45
A-50-80-Bach-0.021	24.1	348 282	1577	14.0	541	6340	11.7	55	644	45
A-50-80-MLCDRAT-0.012	23.9	350 286	1564	13.9	537	6271	11.7	56	652	45
A-55-80-MPLCOm2012-0.011	22.6	352 002	1552	13.8	535	6348	11.9	55	658	42
A-55-80-Bach-0.02	24.6	357 203	1586	14.1	545	6319	11.6	57	655	45
A-50-77-MPLCOm2012-0.01	22.7	357 345	1369	12.6	488	6529	13.4	55	732	47
A-50-80-Bach-0.02	24.7	364 767	1603	14.3	555	6545	11.8	56	657	45
A-55-80-MLCDRAT-0.011	25.5	369 025	1595	14.2	549	6384	11.6	58	672	46

Scenario	% Eligible	LDCT Screens	Screen-Detected Lung Cancer Cases	Lung Cancer Mortality Reduction (%)	Lung Cancer Deaths Averted	Life-Years Gained	Life-Years Gained per Lung Cancer Deaths Averted	LDCT Screens per Life-Years Gained	LDCT Screens per Lung Cancer Death Averted	NNS
A-55-80-20-20[c]	22.0	369 610	1423	12.9	500	6379	12.8	58	739	44
A-50-80-MPLCOm2012-0.011	22.8	370 909	1582	14.2	550	6686	12.2	55	674	41
A-55-80-Bach-0.019	25.2	372 598	1611	14.3	554	6458	11.7	58	673	45
A-55-80-MPLCOm2012-0.01	23.7	375 484	1586	14.1	548	6519	11.9	58	685	43
A-50-80-MLCDRAT-0.011	25.5	377 864	1613	14.4	558	6607	11.8	57	677	46
A-50-80-Bach-0.019	25.3	381 778	1624	14.4	559	6652	11.9	57	683	45
A-55-80-Bach-0.018	25.8	389 243	1632	14.5	563	6589	11.7	59	691	46
A-55-80-MLCDRAT-0.01	27.7	398 180	1641	14.6	564	6605	11.7	60	706	49
A-50-80-Bach-0.018	26.0	400 457	1653	14.8	572	6846	12.0	58	700	45
A-50-80-MPLCOm2012-0.01	23.9	401 856	1622	14.6	564	6957	12.3	58	713	42
A-55-80-20-25[c]	22.7	404 596	1492	13.5	523	6654	12.7	61	774	43
A-55-80-Bach-0.017	26.5	406 323	1657	14.9	575	6774	11.8	60	707	46
A-50-80-MLCDRAT-0.01	27.9	409 804	1662	14.8	575	6871	11.9	60	713	49
A-50-80-20-15[c]	22.6	419 030	1401	13.0	503	6918	13.8	61	833	45
A-50-80-Bach-0.017	26.6	420 352	1678	15.1	586	7039	12.0	60	717	45
A-55-80-Bach-0.016	27.2	423 929	1677	15.0	582	6908	11.9	61	728	47
A-55-80-MPLCOm2012-0.008	26.2	432 557	1662	14.9	579	6975	12.0	62	747	45
A-55-80-MLCDRAT-0.009	30.4	433 597	1696	15.0	583	6869	11.8	63	744	52
A-50-80-MPLCOm2012-0.009	25.1	437 273	1665	15.0	582	7291	12.5	60	751	43
A-50-80-Bach-0.016	27.4	441 294	1704	15.4	595	7190	12.1	61	742	46
A-55-80-Bach-0.015	27.9	442 384	1700	15.3	592	7034	11.9	63	747	47
A-50-80-MLCDRAT-0.009	30.6	449 030	1717	15.4	596	7168	12.0	63	753	51
A-55-80-Bach-0.014	28.7	461 609	1723	15.5	602	7179	11.9	64	767	48
A-50-80-Bach-0.015	28.1	463 301	1727	15.6	605	7391	12.2	63	766	46
A-50-80-20-20[c]	23.3	463 457	1487	13.8	534	7301	13.7	63	868	44
A-55-80-MLCDRAT-0.008	33.3	474 060	1749	15.6	606	7147	11.8	66	782	55
A-50-80-MPLCOm2012-0.008	26.6	478 349	1710	15.5	601	7564	12.6	63	796	44
A-55-80-Bach-0.013	29.5	482 093	1744	15.8	610	7330	12.0	66	790	48
A-50-80-Bach-0.014	28.9	486 484	1752	15.9	616	7582	12.3	64	790	47
A-50-80-MLCDRAT-0.008	33.5	495 424	1779	16.0	619	7508	12.1	66	800	54
A-50-80-20-25[c]	23.6	500 430	1560	14.4	558	7596	13.6	66	897	42
A-55-80-Bach-0.012	30.3	503 871	1768	16.0	617	7467	12.1	67	817	49
A-50-80-Bach-0.013	29.7	511 462	1778	16.2	627	7746	12.4	66	816	47
A-55-80-MLCDRAT-0.007	36.3	520 869	1805	16.2	629	7496	11.9	69	828	58
A-50-80-MPLCOm2012-0.007	28.2	524 392	1754	16.0	620	7904	12.7	66	846	45
A-55-80-Bach-0.011	31.3	527 263	1793	16.2	628	7606	12.1	69	840	50
A-50-80-Bach-0.012	30.6	538 488	1806	16.4	635	7914	12.5	68	848	48

Scenario	% Eligible	LDCT Screens	Screen-Detected Lung Cancer Cases	Lung Cancer Mortality Reduction (%)	Lung Cancer Deaths Averted	Life-Years Gained	Life-Years Gained per Lung Cancer Deaths Averted	LDCT Screens per Life-Years Gained	LDCT Screens per Lung Cancer Death Averted	NNS
A-50-80-MLCDRAT-0.007	36.5	550 777	1843	16.7	647	7943	12.3	69	851	56
A-55-80-Bach-0.01	32.3	551 762	1816	16.5	639	7773	12.2	71	863	51
A-50-80-Bach-0.011	31.6	568 005	1834	16.7	648	8156	12.6	70	877	49
A-50-80-MPLCOm2012-0.006	30.0	575 496	1797	16.4	635	8164	12.9	70	906	47
A-55-80-MLCDRAT-0.006	39.0	577 420	1865	16.9	655	7830	12.0	74	882	60
A-50-80-Bach-0.01	32.7	599 143	1862	17.1	662	8387	12.7	71	905	49

[a] Strategies with at least 9.0 percent lung cancer mortality reduction and fewer than 600,000 LDCTs.

[b] 2013 USPSTF-recommended strategy.

[c] Six selected consensus-efficient 20 pack-year strategies.

Numbers are per a 100,000-person cohort followed from ages 45 to 90 years and are based on mean estimates across the four models. The risk model–based screening programs are labeled as follows: frequency (A–annual and B–biennial)–age start–age stop–lung cancer risk prediction model (MPLCOm2012, MLCDRAT, Bach)–risk threshold. The risk factor–based screening programs are labeled as follows: frequency (A–annual and B–biennial)–age start–age stop–minimum pack-years–maximum years since quitting.

Abbreviations: LDCT=low-dose computed tomography; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force.

eTable 13. Harms of 144 Selected[a] Consensus-Efficient Risk Model–Based or Risk Factor–Based Screening Programs Plus the 2013 USPSTF-Recommended Criteria and Six Selected 20 Pack-Year Scenarios Ordered by LDCT Screens—1960 Birth Cohort

Scenario	LDCT Screens	LDCT Scans	Mean LDCT Screens per Person Screened	Mean False-Positive Results per Person Screened	Biopsies	Overdiag-nosed Cases	Overdiag-nosis: % of All Lung Cancer Cases	Overdiag-nosis: % of Screen-Detected Lung Cancer Cases	Radiation-Related Lung Cancer Deaths[d]
B-50-80-MLCDRAT-0.015	148 360	165 827	7.2	1.0	506	76	1.5	6.5	11.1
B-50-80-Bach-0.025	150 601	168 292	7.0	1.0	516	76	1.5	6.3	11.0
B-50-80-MPLCOm2012-0.014	153 324	170 855	7.8	1.1	512	73	1.5	6.1	11.9
B-55-80-Bach-0.024	154 299	172 167	7.0	1.0	516	74	1.5	6.2	11.5
B-50-80-Bach-0.024	157 520	175 651	7.1	1.0	529	77	1.5	6.3	11.8
B-55-80-MPLCOm2012-0.013	158 123	175 963	7.8	1.1	514	71	1.4	6.0	12.5
B-50-80-MLCDRAT-0.014	158 658	176 788	7.3	1.0	524	77	1.6	6.4	12.0
B-50-80-MPLCOm2012-0.013	164 259	182 478	8.0	1.1	531	74	1.5	6.1	13.4
B-50-80-Bach-0.023	164 603	183 169	7.3	1.0	541	78	1.6	6.3	12.3
B-50-80-Bach-0.022	172 049	191 083	7.4	1.0	553	79	1.6	6.3	12.8
A-55-80-MPLCOm2012-0.023	174 860	192 554	12.2	1.5	508	80	1.6	6.8	11.2
A-50-80-MPLCOm2012-0.023	174 911	192 601	12.2	1.5	508	80	1.6	6.8	11.2
B-55-80-Bach-0.021	175 310	194 510	7.4	1.0	550	75	1.5	6.0	13.1
B-50-80-MPLCOm2012-0.012	176 755	195 746	8.2	1.1	552	76	1.5	6.1	13.7
A-55-80-MLCDRAT-0.023	179 310	197 439	11.5	1.4	513	84	1.7	7.1	10.9
B-50-80-Bach-0.021	180 105	199 649	7.5	1.1	565	79	1.6	6.2	13.7
B-55-80-Bach-0.02	182 833	202 516	7.5	1.1	562	76	1.5	6.0	13.9
A-55-80-MPLCOm2012-0.022	184 176	202 396	12.5	1.5	523	82	1.6	6.8	12.1
A-50-80-MPLCOm2012-0.022	184 284	202 513	12.5	1.5	523	82	1.6	6.8	12.1
B-50-80-Bach-0.02	188 573	208 640	7.7	1.1	579	80	1.6	6.1	14.6
B-55-80-Bach-0.019	190 612	210 780	7.6	1.1	574	77	1.5	6.0	14.5
B-50-80-MPLCOm2012-0.011	191 379	211 271	8.4	1.2	575	77	1.6	6.0	15.3
A-55-80-MPLCOm2012-0.021	193 965	212 755	12.7	1.5	539	84	1.7	6.8	13.2
A-55-80-Bach-0.034	194 099	213 177	11.4	1.4	546	88	1.8	7.1	12.8
A-50-80-MPLCOm2012-0.021	194 193	212 990	12.7	1.5	540	84	1.7	6.8	13.2
A-50-80-Bach-0.034	194 261	213 338	11.4	1.4	546	87	1.7	7.0	12.8
B-50-80-Bach-0.019	197 209	217 812	7.8	1.1	593	81	1.6	6.1	15.2
A-55-80-Bach-0.033	202 943	222 529	11.6	1.4	560	88	1.8	6.9	13.5
A-50-80-Bach-0.033	203 167	222 759	11.6	1.4	560	88	1.8	6.9	13.6
A-55-80-MPLCOm2012-0.02	204 612	224 001	13.0	1.6	555	86	1.7	6.8	14.1
A-50-80-MPLCOm2012-0.02	205 020	224 420	13.0	1.6	555	85	1.7	6.7	14.2
B-50-80-Bach-0.018	206 581	227 744	8.0	1.1	606	82	1.7	6.1	16.0
B-50-80-MPLCOm2012-0.01	206 957	227 804	8.7	1.2	598	79	1.6	6.0	16.9
A-50-80-MLCDRAT-0.02	210 560	230 513	12.1	1.5	565	89	1.8	7.0	13.3

Scenario	LDCT Screens	LDCT Scans	Mean LDCT Screens per Person Screened	Mean False-Positive Results per Person Screened	Biopsies	Overdiag-nosed Cases	Overdiag-nosis: % of All Lung Cancer Cases	Overdiag-nosis: % of Screen-Detected Lung Cancer Cases	Radiation-Related Lung Cancer Deaths[d]
A-55-80-Bach-0.032	212 181	232 294	11.8	1.4	574	90	1.8	6.9	14.1
A-50-80-Bach-0.032	212 490	232 621	11.8	1.4	575	89	1.8	6.9	14.1
A-55-80-MPLCOm2012-0.019	216 291	236 355	13.3	1.6	573	87	1.7	6.7	15.1
A-50-80-MPLCOm2012-0.019	217 030	237 128	13.2	1.6	574	87	1.7	6.7	15.2
A-55-80-Bach-0.031	221 421	242 072	12.0	1.5	589	91	1.8	6.9	14.8
A-50-80-Bach-0.031	221 847	242 513	12.0	1.5	589	90	1.8	6.8	14.9
B-50-80-MPLCOm2012-0.009	225 054	247 007	9.0	1.2	623	80	1.6	5.9	18.5
A-50-80-MLCDRAT-0.019	225 292	246 094	12.4	1.5	587	91	1.8	6.9	14.6
B-50-80-Bach-0.016	227 395	249 832	8.3	1.2	637	84	1.7	6.1	18.2
A-55-80-30-15[b]	227 443	247 644	16.1	1.9	518	69	1.4	6.3	20.6
A-55-80-MPLCOm2012-0.018	228 676	249 442	13.5	1.6	591	89	1.8	6.7	15.8
A-50-80-MPLCOm2012-0.018	229 944	250 782	13.5	1.6	594	90	1.8	6.8	15.9
A-55-80-Bach-0.03	231 518	252 744	12.2	1.5	604	93	1.9	6.9	15.5
A-50-80-Bach-0.03	232 092	253 350	12.2	1.5	605	93	1.9	6.9	15.6
A-50-80-MLCDRAT-0.018	236 479	257 928	12.7	1.5	604	92	1.8	6.9	15.6
A-55-80-MLCDRAT-0.018	236 483	257 918	12.7	1.5	604	92	1.8	6.9	15.6
A-55-80-Bach-0.029	241 484	263 290	12.4	1.5	618	94	1.9	6.9	16.2
A-50-80-Bach-0.029	242 278	264 120	12.4	1.5	620	94	1.9	6.8	16.3
A-55-80-MPLCOm2012-0.017	242 329	263 878	13.8	1.6	610	90	1.8	6.7	17.1
A-50-80-MPLCOm2012-0.017	244 349	265 995	13.9	1.7	614	92	1.8	6.8	17.4
B-50-80-MPLCOm2012-0.008	245 777	268 980	9.3	1.3	653	83	1.7	5.9	20.0
B-50-80-Bach-0.014	250 390	274 208	8.7	1.2	668	86	1.7	6.0	19.6
A-55-80-Bach-0.028	252 590	275 022	12.6	1.5	634	96	1.9	6.9	16.8
A-50-80-Bach-0.028	253 613	276 110	12.7	1.5	636	95	1.9	6.8	17.0
A-50-80-MLCDRAT-0.017	253 620	276 030	13.1	1.6	628	95	1.9	6.9	17.0
A-55-80-MPLCOm2012-0.016	256 724	279 088	14.0	1.7	630	92	1.8	6.7	18.3
A-50-80-MPLCOm2012-0.016	259 832	282 347	14.2	1.7	635	94	1.9	6.7	18.9
B-50-80-Bach-0.013	263 135	287 720	8.9	1.2	685	86	1.7	5.9	20.8
A-55-80-Bach-0.027	263 986	287 083	12.8	1.5	650	97	1.9	6.8	17.9
A-50-80-Bach-0.027	265 411	288 573	12.9	1.6	652	97	1.9	6.8	18.1
A-50-80-MLCDRAT-0.016	267 426	290 613	13.4	1.6	648	97	1.9	6.9	18.1
B-50-80-MPLCOm2012-0.007	270 148	294 837	9.6	1.3	685	85	1.7	5.9	21.9
A-55-80-MPLCOm2012-0.015	272 809	296 092	14.4	1.7	651	93	1.9	6.6	19.5
A-55-80-Bach-0.026	275 329	299 073	13.0	1.6	665	99	2.0	6.9	18.7
B-50-80-Bach-0.012	277 033	302 448	9.1	1.2	704	87	1.8	5.9	22.1
A-50-80-Bach-0.026	277 066	300 897	13.1	1.6	667	98	2.0	6.8	18.9

Scenario	LDCT Screens	LDCT Scans	Mean LDCT Screens per Person Screened	Mean False-Positive Results per Person Screened	Biopsies	Overdiag-nosed Cases	Overdiag-nosis: % of All Lung Cancer Cases	Overdiag-nosis: % of Screen-Detected Lung Cancer Cases	Radiation-Related Lung Cancer Deaths[d]
A-50-80-MPLCOm2012-0.015	277 426	300 937	14.6	1.7	659	94	1.9	6.6	20.2
A-50-77-MPLCOm2012-0.013	280 113	303 848	14.2	1.7	609	72	1.4	5.7	22.0
A-50-80-MLCDRAT-0.015	286 154	310 413	13.8	1.6	674	99	2.0	6.8	19.2
A-55-80-Bach-0.025	287 935	312 383	13.3	1.6	682	99	2.0	6.7	19.6
A-50-80-Bach-0.025	290 340	314 916	13.4	1.6	685	99	2.0	6.7	20.0
A-55-80-MPLCOm2012-0.014	290 431	314 704	14.7	1.7	675	95	1.9	6.5	20.5
B-50-80-Bach-0.011	292 128	318 447	9.3	1.3	723	89	1.8	5.9	23.0
B-50-80-MPLCOm2012-0.006	296 680	322 996	9.9	1.3	719	88	1.8	5.9	23.8
A-50-80-MPLCOm2012-0.014	297 009	321 624	15.0	1.8	684	96	1.9	6.5	21.3
A-55-80-Bach-0.024	300 842	326 030	13.6	1.6	698	101	2.0	6.8	20.3
A-50-77-MPLCOm2012-0.012	303 023	328 035	14.7	1.8	637	73	1.5	5.6	24.1
A-55-80-MLCDRAT-0.014	303 286	328 536	14.0	1.7	695	100	2.0	6.8	20.4
A-50-80-Bach-0.024	303 778	329 091	13.6	1.6	703	100	2.0	6.7	20.6
A-50-80-MLCDRAT-0.014	306 138	331 531	14.1	1.7	699	100	2.0	6.7	20.7
B-50-80-Bach-0.01	308 091	335 373	9.5	1.3	744	90	1.8	5.9	24.4
A-55-80-MPLCOm2012-0.013	309 284	334 629	15.0	1.8	697	96	1.9	6.5	21.8
A-55-80-Bach-0.023	313 914	339 831	13.8	1.6	716	102	2.0	6.7	21.0
A-50-80-Bach-0.023	317 678	343 778	13.9	1.7	721	101	2.0	6.6	21.5
A-50-80-MPLCOm2012-0.013	318 502	344 299	15.4	1.8	709	98	2.0	6.5	23.1
A-55-80-MLCDRAT-0.013	320 862	347 108	14.2	1.7	718	102	2.0	6.7	21.3
A-50-80-MLCDRAT-0.013	325 175	351 637	14.3	1.7	724	102	2.0	6.7	21.9
B-50-80-Bach-0.009	325 901	354 263	9.6	1.3	767	91	1.8	5.9	25.7
B-50-80-MPLCOm2012-0.005	327 272	355 416	10.3	1.4	756	89	1.8	5.8	25.3
A-55-80-Bach-0.022	327 719	354 413	14.0	1.7	732	103	2.1	6.7	22.3
A-50-77-MPLCOm2012-0.011	328 622	355 052	15.2	1.8	665	74	1.5	5.6	26.0
A-55-80-20-15[c]	330 095	356 390	16.0	1.9	667	83	1.7	6.2	29.0
A-55-80-MPLCOm2012-0.012	330 347	356 878	15.3	1.8	723	98	2.0	6.5	23.3
A-50-80-Bach-0.022	332 451	359 385	14.2	1.7	738	103	2.1	6.6	22.9
A-55-80-Bach-0.021	342 337	369 858	14.3	1.7	750	105	2.1	6.7	23.1
A-50-80-MPLCOm2012-0.012	343 293	370 477	15.8	1.9	740	99	2.0	6.4	25.2
A-55-80-MLCDRAT-0.012	343 713	371 269	14.4	1.7	745	104	2.1	6.7	23.0
A-50-80-Bach-0.021	348 282	376 097	14.5	1.7	757	104	2.1	6.6	24.0
A-50-80-MLCDRAT-0.012	350 286	378 187	14.7	1.7	754	103	2.1	6.6	23.9
A-55-80-MPLCOm2012-0.011	352 002	379 754	15.6	1.8	749	100	2.0	6.4	24.7
A-55-80-Bach-0.02	357 203	385 566	14.5	1.7	766	105	2.1	6.6	24.1
A-50-77-MPLCOm2012-0.01	357 345	385 345	15.7	1.9	697	76	1.5	5.6	28.7

Scenario	LDCT Screens	LDCT Scans	Mean LDCT Screens per Person Screened	Mean False-Positive Results per Person Screened	Biopsies	Overdiag-nosed Cases	Overdiag-nosis: % of All Lung Cancer Cases	Overdiag-nosis: % of Screen-Detected Lung Cancer Cases	Radiation-Related Lung Cancer Deaths[d]
A-50-80-Bach-0.02	364 767	393 511	14.8	1.7	776	105	2.1	6.6	25.1
A-55-80-MLCDRAT-0.011	369 025	398 078	14.5	1.7	777	105	2.1	6.6	24.6
A-55-80-20-20[c]	369 610	398 094	16.8	2.0	722	89	1.8	6.3	30.6
A-50-80-MPLCOm2012-0.011	370 909	399 603	16.3	1.9	770	101	2.0	6.4	27.2
A-55-80-Bach-0.019	372 598	401 805	14.8	1.7	784	106	2.1	6.6	25.2
A-55-80-MPLCOm2012-0.01	375 484	404 571	15.8	1.9	776	102	2.0	6.4	26.5
A-50-80-MLCDRAT-0.011	377 864	407 366	14.8	1.7	789	105	2.1	6.5	25.8
A-50-80-Bach-0.019	381 778	411 439	15.1	1.8	794	106	2.1	6.5	26.4
A-55-80-Bach-0.018	389 243	419 367	15.1	1.8	802	107	2.2	6.6	26.5
A-55-80-MLCDRAT-0.01	398 180	429 019	14.4	1.7	813	108	2.2	6.6	26.5
A-50-80-Bach-0.018	400 457	431 163	15.4	1.8	816	107	2.1	6.5	28.0
A-50-80-MPLCOm2012-0.01	401 856	432 251	16.8	2.0	804	104	2.1	6.4	29.8
A-55-80-20-25[c]	404 596	434 892	17.8	2.1	765	94	1.9	6.3	31.9
A-55-80-Bach-0.017	406 323	437 409	15.3	1.8	822	109	2.2	6.6	28.0
A-50-80-MLCDRAT-0.01	409 804	441 216	14.7	1.7	827	108	2.2	6.5	28.2
A-50-80-20-15[c]	419 030	449 947	18.5	2.2	750	84	1.7	6.0	38.6
A-50-80-Bach-0.017	420 352	452 129	15.8	1.8	837	108	2.2	6.4	30.1
A-55-80-Bach-0.016	423 929	455 993	15.6	1.8	840	110	2.2	6.6	29.2
A-55-80-MPLCOm2012-0.008	432 557	464 850	16.5	1.9	839	106	2.1	6.4	30.0
A-55-80-MLCDRAT-0.009	433 597	466 571	14.3	1.7	856	112	2.2	6.6	29.3
A-50-80-MPLCOm2012-0.009	437 273	469 612	17.4	2.0	841	105	2.1	6.3	32.3
A-50-80-Bach-0.016	441 294	474 232	16.1	1.9	860	110	2.2	6.5	31.6
A-55-80-Bach-0.015	442 384	475 479	15.9	1.9	860	111	2.2	6.5	30.4
A-50-80-MLCDRAT-0.009	449 030	482 762	14.7	1.7	872	111	2.2	6.5	31.4
A-55-80-Bach-0.014	461 609	495 768	16.1	1.9	880	112	2.2	6.5	31.8
A-50-80-Bach-0.015	463 301	497 449	16.5	1.9	882	110	2.2	6.4	33.3
A-50-80-20-20[c]	463 457	496 698	19.9	2.3	804	89	1.8	6.0	40.6
A-55-80-MLCDRAT-0.008	474 060	509 474	14.2	1.7	902	114	2.3	6.5	31.5
A-50-80-MPLCOm2012-0.008	478 349	512 920	18.0	2.1	883	108	2.2	6.3	35.4
A-55-80-Bach-0.013	482 093	517 364	16.3	1.9	900	113	2.3	6.5	33.3
A-50-80-Bach-0.014	486 484	521 881	16.8	2.0	905	111	2.2	6.3	35.0
A-50-80-MLCDRAT-0.008	495 424	531 893	14.8	1.7	925	114	2.3	6.4	34.2
A-50-80-20-25[c]	500 430	535 519	21.2	2.5	849	94	1.9	6.0	42.5
A-55-80-Bach-0.012	503 871	540 363	16.6	1.9	922	114	2.3	6.4	34.6
A-50-80-Bach-0.013	511 462	548 218	17.2	2.0	930	112	2.2	6.3	37.1
A-55-80-MLCDRAT-0.007	520 869	559 024	14.3	1.7	953	117	2.3	6.5	34.0

Scenario	LDCT Screens	LDCT Scans	Mean LDCT Screens per Person Screened	Mean False-Positive Results per Person Screened	Biopsies	Overdiag-nosed Cases	Overdiag-nosis: % of All Lung Cancer Cases	Overdiag-nosis: % of Screen-Detected Lung Cancer Cases	Radiation-Related Lung Cancer Deaths[d]
A-50-80-MPLCOm2012-0.007	524 392	561 495	18.6	2.1	928	110	2.2	6.3	38.6
A-55-80-Bach-0.011	527 263	565 051	16.8	2.0	946	115	2.3	6.4	36.0
A-50-80-Bach-0.012	538 488	576 709	17.6	2.0	957	113	2.3	6.3	39.1
A-50-80-MLCDRAT-0.007	550 777	590 414	15.1	1.8	984	117	2.3	6.3	37.6
A-55-80-Bach-0.01	551 762	590 917	17.1	2.0	970	116	2.3	6.4	37.5
A-50-80-Bach-0.011	568 005	607 834	18.0	2.1	985	115	2.3	6.3	41.1
A-50-80-MPLCOm2012-0.006	575 496	615 371	19.2	2.2	976	112	2.2	6.2	42.0
A-55-80-MLCDRAT-0.006	577 420	618 778	14.8	1.7	1011	120	2.4	6.4	37.3
A-50-80-Bach-0.01	599 143	640 649	18.3	2.1	1015	117	2.3	6.3	43.3

[a] Strategies with at least 9.0 percent lung cancer mortality reduction and fewer than 600,000 LDCTs.
[b] 2013 USPSTF-recommended strategy.
[c] Six selected consensus-efficient 20 pack-year strategies.
[d] Mean of 2 models (MGH-HMS and UM).
Numbers are per a 100,000-person cohort followed from ages 45 to 90 years and are based on mean estimates across the four models. The screening programs are labeled as follows: frequency (A–annual and B–biennial)–age start–age stop–lung cancer risk prediction model (MPLCOm2012, MLCDRAT, Bach)–risk threshold.
Abbreviations: LDCT=low-dose computed tomography; MGH-HMS=Massachusetts General Hospital–Harvard Medical School; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; USPSTF=U.S. Preventive Services Task Force.

eTable 14. Comparison of the 2013 USPSTF-Recommended (A-55-80-30-15) and Risk Model–Based USPSTF-Like Scenarios

	A-55-80-30-15	A-55-80-MPLCOm2012-0.018	A-55-80-MLCDRAT-0.018	A-55-80-Bach-0.03
% eligible	14.1%	17.0%	18.6%	19.0%
# LDCT screens[a]	227 443	228 676	236 483	231 518
Mean # of LDCT screens per person screened	16.1	13.5	12.7	12.2
Mean age at first screen	56.2	64.0	64.5	65.4
Mean age at last screen	71.3	76.5	76.5	76.8
Mean age at screening	65.1	69.6	70.1	70.3
Lung cancer deaths averted[a]	381	444	448	450
Mortality reduction	9.8%	11.5%	11.5%	11.6%
Difference in lung cancer deaths averted vs. USPSTF strategy	NA	16.5%	17.6%	18.1%
Mean # screens per lung cancer death averted	597	515	528	514
Life-years gained[a]	4882	4982	4916	4936
Difference in life-years gained vs. USPSTF strategy	NA	2.0%	0.7%	1.1%
Mean # screens per life-years gained	47	46	48	47
NNS	37	38	42	42
False-positive screens per person screened	1.9	1.6	1.5	1.5
Biopsies	518	591	604	604
Overdiagnosed cases[a]	69	89	92	93
Overdiagnosis rate per screen-detected cancers	6.3%	6.7%	6.9%	6.9%
Radiation-related lung cancer deaths[a]	20.6	15.8	15.6	15.5

[a] Per 100,000 individuals.

Abbreviations: LDCT=low-dose computed tomography; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force.

eTable 15. Comparison of the A-55-80-20-15 and Equivalent Risk Model–Based Screening Scenarios

Outcome	A-55-80-20-15	A-55-80-MPLCOm2012-0.012	A-55-80-MLCDRAT-0.012	A-55-80-Bach-0.022
% eligible	20.6%	21.6%	23.8%	23.4%
# LDCT screens[a]	330 095	330 347	343 713	327 719
Mean # of LDCT screens per person screened	16.0	15.3	14.4	14.0
Mean age at first screen	55.7	62.0	62.8	63.4
Mean age at last screen	70.7	76.3	76.4	76.6
Mean age at screening	65.1	68.5	69.1	69.3
Lung cancer deaths averted[a]	469	520	532	527
Mortality reduction	12.1%	13.4%	13.7%	13.6%
Difference in lung cancer deaths averted vs. A-55-80-20-15 strategy	NA	10.9%	13.4%	12.4%
Mean # screens per lung cancer deaths averted	704	635	646	622
Life-years gained[a]	6018	6146	6126	6024
Difference in life-years gained vs. A-55-80-20-15 strategy	NA	2.1%	1.0%	0.1%
Mean # screens per life-years gained	55	54	56	54
NNS	44	42	45	44
False-positive screens per person screened	1.9	1.8	1.7	1.7
Biopsies	667	723	745	732
Overdiagnosed cases[a]	83	98	104	103
Overdiagnosis rate per screen-detected cancers	6.2%	6.5%	6.6%	6.7%
Radiation-related lung cancer deaths[a]	29.0	23.3	23.0	22.3

[a] Per 100,000 individuals.

Abbreviations: LDCT=low-dose computed tomography; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force; vs.=versus.

eTable 16. Comparison of the A-55-80-20-20 and Equivalent Risk Model–Based Screening Scenarios

Outcome	A-55-80-20-20	A-55-80-MPLCOm2012-0.010	A-55-80-MLCDRAT-0.011	A-55-80-Bach-0.019
% eligible	22.0%	23.7%	25.5%	25.2%
# LDCT screens[a]	369 610	375 484	369 025	372 598
Mean # of LDCT screens per person screened	16.8	15.8	14.5	14.8
Mean age at first screen	55.6	61.5	62.8	62.6
Mean age at last screen	71.4	76.3	76.5	76.5
Mean age at screening	65.3	68.2	68.9	68.9
Lung cancer deaths averted[a]	500	548	549	554
Mortality reduction	12.9%	14.1%	14.2%	14.3%
Difference in lung cancer deaths averted vs. A-55-80-20-20 strategy	NA	9.6%	9.8%	10.8%
Mean # screens per lung cancer deaths averted	739	685	672	673
Life-years gained[a]	6379	6519	6384	6458
Difference in life-years gained vs. A-55-80-20-20 strategy	NA	2.2%	0.1%	1.2%
Mean # screens per life-years gained	58	58	58	58
NNS	44	43	46	45
False-positive screens per person screened	2.0	1.9	1.7	1.7
Biopsies	722	776	777	784
Overdiagnosed cases[a]	89	102	105	106
Overdiagnosis rate per screen-detected cancers	6.3%	6.4%	6.6%	6.6%
Radiation-related lung cancer deaths[a]	30.6	26.5	24.6	25.2

[a] Per 100,000 individuals.

Abbreviations: LDCT=low-dose computed tomography; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force; vs.=versus.

eTable 17. Comparison of the A-55-80-20-25 and Equivalent Risk Model–Based Screening Scenarios

Outcome	A-55-80-20-25	A-55-80-MPLCOm2012-0.008	A-55-80-MLCDRAT-0.010	A-55-80-Bach-0.017
% eligible	22.7%	26.2%	27.7%	26.5%
# LDCT screens[a]	404 596	432 557	398 180	406 323
Mean # of LDCT screens per person screened	17.8	16.5	14.4	15.3
Mean age at first screen	55.6	60.8	63.0	62.0
Mean age at last screen	72.5	76.3	76.6	76.4
Mean age at screening	65.5	68.1	68.8	68.7
Lung cancer deaths averted[a]	523	579	564	575
Mortality reduction	13.5%	14.9%	14.6%	14.9%
Difference in lung cancer deaths averted vs. A-55-80-20-25 strategy	NA	10.7%	7.8%	9.9%
Mean # screens per lung cancer deaths averted	774	747	706	707
Life-years gained[a]	6654	6975	6605	6774
Difference in life-years gained vs. A-55-80-20-25 strategy	NA	4.8%	-0.7%	1.8%
Mean # screens per life-years gained	61	62	60	60
NNS	43	45	49	46
False-positive screens per person screened	2.1	1.9	1.7	1.8
Biopsies	765	839	813	822
Overdiagnosed cases[a]	94	106	108	109
Overdiagnosis rate per screen-detected cancers	6.3%	6.4%	6.6%	6.6%
Radiation-related lung cancer deaths[a]	31.9	30.0	26.5	28.0

[a] Per 100,000 individuals.

Abbreviations: LDCT=low-dose computed tomography; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force; vs.=versus.

eTable 18. Comparison of the A-50-80-20-15 and Equivalent Risk Model–Based Screening Scenarios

Outcome	A-50-80-20-15	A-50-80-MPLCOm2012-0.010	A-50-80-MLCDRAT-0.010	A-50-80-Bach-0.017
% eligible	22.6%	23.9%	27.9%	26.6%
# LDCT screens[a]	419 030	401 856	409 804	420 352
Mean # of LDCT screens per person screened	18.5	16.8	14.7	15.8
Mean age at first screen	51.5	60.3	62.6	61.4
Mean age at last screen	69.0	76.0	76.5	76.3
Mean age at screening	59.0	63.3	64.0	64.0
Lung cancer deaths averted[a]	503	564	575	586
Mortality reduction	13.0%	14.6%	14.8%	15.1%
Difference in lung cancer deaths averted vs. A-50-80-20-15 strategy	NA	12.1%	14.3%	16.5%
Mean # screens per lung cancer deaths averted	833	713	713	717
Life-years gained[a]	6918	6957	6871	7039
Difference in life-years gained vs. A-50-80-20-15 strategy	NA	0.6%	-0.7%	1.7%
Mean # screens per life-years gained	61	58	60	60
NNS	45	42	49	45
False-positive screens per person screened	2.2	2.0	1.7	1.8
Biopsies	750	804	827	837
Overdiagnosed cases[a]	84	104	108	108
Overdiagnosis rate per screen-detected cancers	6.0%	6.4%	6.5%	6.4%
Radiation-related lung cancer deaths[a]	38.6	29.8	28.2	30.1

[a] Per 100,000 individuals.

Abbreviations: LDCT=low-dose computed tomography; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force; vs.=versus.

eTable 19. Comparison of the A-50-80-20-20 and Equivalent Risk Model–Based Screening Scenarios

Outcome	A-50-80-20-20	A-50-80-MPLCOm2012-0.008	A-50-80-MLCDRAT-0.009	A-50-80-Bach-0.015
% eligible	23.3%	26.6%	30.6%	28.1%
# LDCT screens[a]	463 457	478 349	449 030	463 301
Mean # of LDCT screens per person screened	19.9	18.0	14.7	16.5
Mean age at first screen	51.5	59.0	62.7	60.6
Mean age at last screen	70.3	76.0	76.6	76.2
Mean age at screening	59.4	62.9	63.7	63.8
Lung cancer deaths averted[a]	534	601	596	605
Mortality reduction	13.8%	15.5%	15.4%	15.6%
Difference in lung cancer deaths averted vs. A-50-80-20-20 strategy	NA	12.5%	11.6%	13.3%
Mean # screens per lung cancer deaths averted	868	796	753	766
Life-years gained[a]	7301	7564	7168	7391
Difference in life-years gained vs. A-50-80-20-20 strategy	NA	3.6%	-1.8%	1.2%
Mean # screens per life-years gained	63	63	63	63
NNS	44	44	51	46
False-positive screens per person screened	2.3	2.1	1.7	1.9
Biopsies	804	883	872	882
Overdiagnosed cases[a]	89	108	111	110
Overdiagnosis rate per screen-detected cancers	6.0%	6.3%	6.5%	6.4%
Radiation-related lung cancer deaths[a]	40.6	35.4	31.4	33.3

[a] Per 100,000 individuals.

Abbreviations: LDCT=low-dose computed tomography; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force; vs.=versus.

eTable 20. Comparison of the A-50-80-20-25 and Equivalent Risk Model–Based Screening Scenarios

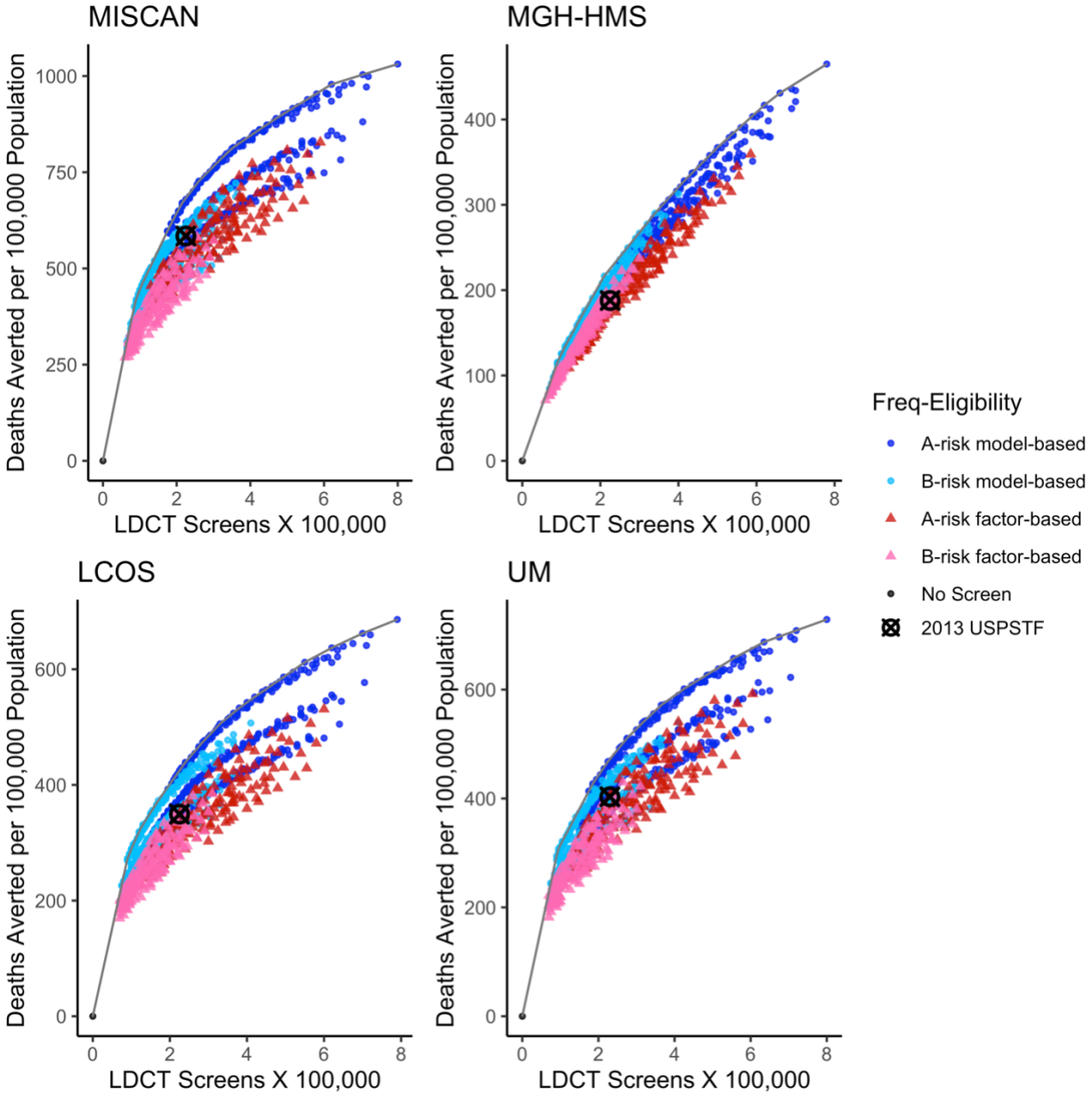
Outcome	A-50-80-20-25	A-50-80-MPLCOm2012-0.008	A-50-80-MLCDRAT-0.008	A-50-80-Bach-0.013
% eligible	23.6%	26.6%	33.5%	29.7%
# LDCT screens[a]	500 430	478 349	495 424	511 462
Mean # of LDCT screens per person screened	21.2	18.0	14.8	17.2
Mean age at first screen	51.5	59.0	62.7	59.9
Mean age at last screen	71.6	76.0	76.6	76.1
Mean age at screening	59.9	62.9	63.6	63.5
Lung cancer deaths averted[a]	558	601	619	627
Mortality reduction	14.4%	15.5%	16.0%	16.2
Difference in lung cancer deaths averted vs. A-50-80-20-25 strategy	NA	7.7%	10.9%	12.4%
Mean # screens per lung cancer deaths averted	897	796	800	816
Life-years gained[a]	7596	7564	7508	7746
Difference in life-years gained vs. A-50-80-20-25 strategy	NA	-0.4%	-1.2%	2.0%
Mean # screens per life-years gained	66	63	66	66
NNS	42	44	54	47
False-positive screens per person screened	2.5	2.1	1.7	2.0
Biopsies	849	883	925	930
Overdiagnosed cases[a]	94	108	114	112
Overdiagnosis rate per screen-detected cancers	6.0%	6.3%	6.4%	6.3%
Radiation-related lung cancer deaths[a]	42.5	35.4	34.2	37.1

[a] Per 100,000 individuals.

Abbreviations: LDCT=low-dose computed tomography; MLCDRAT=Lung Cancer Death Risk Assessment Tool–modified; MPLCOm2012=modified PLCOm2012 model; NNS=number (people) needed to screen (ever) to prevent one lung cancer death; USPSTF=U.S. Preventive Services Task Force; vs.=versus.

eFigures

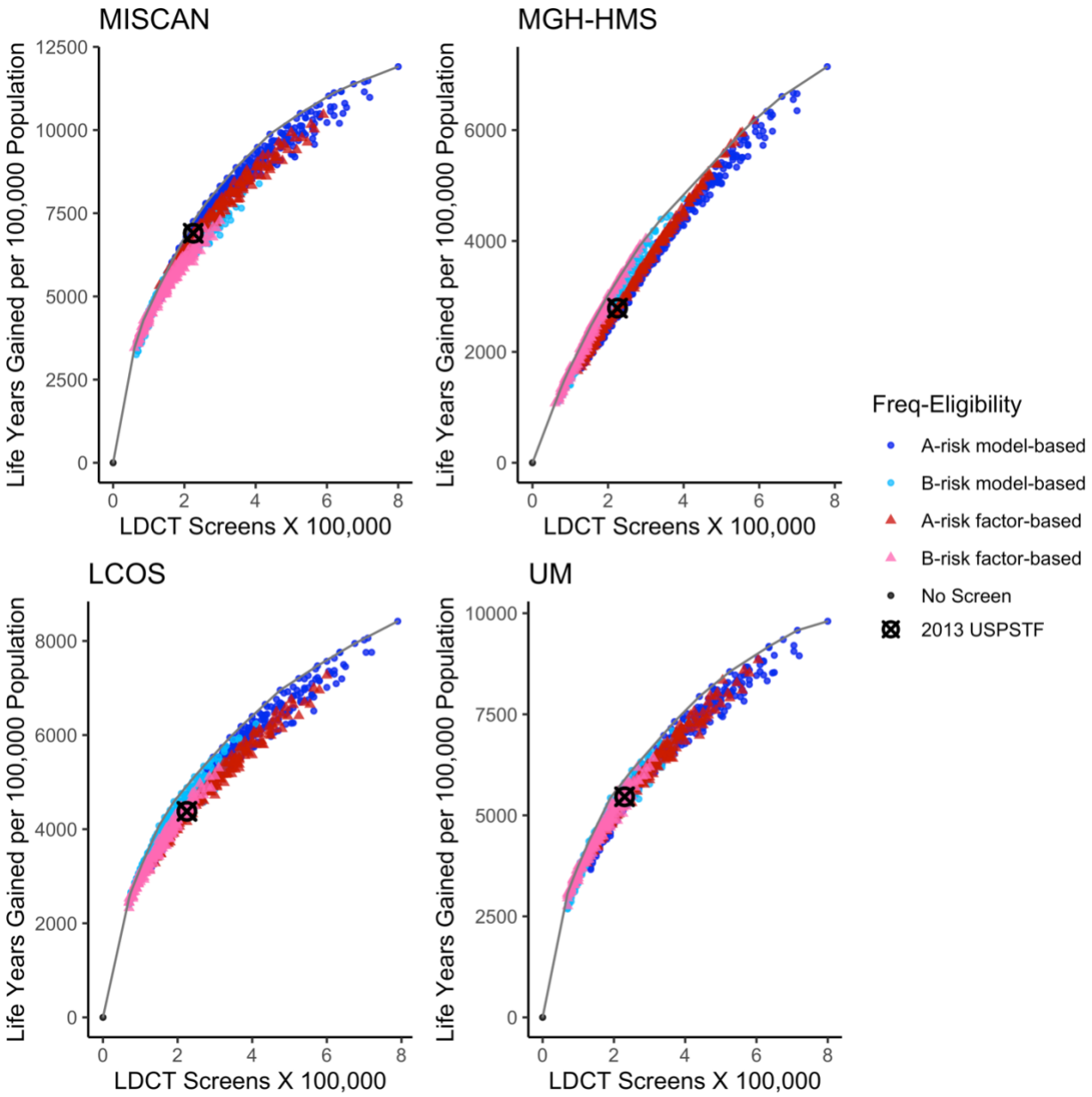
eFigure 1. Number of LDCT Screening Examinations vs. the Number of Lung Cancer Deaths Averted in Each of the Risk Factor–Based and Risk Model–Based Eligibility Strategies Evaluated by the Four CISNET Models—1960 Birth Cohort



Note: Risk factor–based screening scenarios (n=288) are represented with triangle points and risk model–based screening scenarios (n=804) with round points. The line represents the estimated overall efficient frontier per model. Risk factor–based strategies vary by age at starting and stopping screening, frequency, pack-years criterion, and years since quitting smoking (eTable 2). Risk model–based strategies vary by risk model, risk thresholds, and frequency (eTable 2). The colors differentiate strategies by frequency (annual–A vs. biennial–B). The no-screening (black dot) and the 2013 USPSTF-recommended ("⊗" mark) scenarios are highlighted. Four CISNET lung cancer screening simulation models from different institutions were used for the analysis: Microsimulation Screening Analysis (MISCAN)-Lung Model from Erasmus University Medical Center, Massachusetts General Hospital–Harvard Medical School (MGH-HMS), the Lung Cancer Outcomes Simulation (LCOS) from Stanford University, and University of Michigan (UM).

Abbreviations: CISNET=Cancer Intervention and Surveillance Modeling Network; LDCT=low-dose computed tomography; USPSTF=U.S. Preventive Services Task Force.

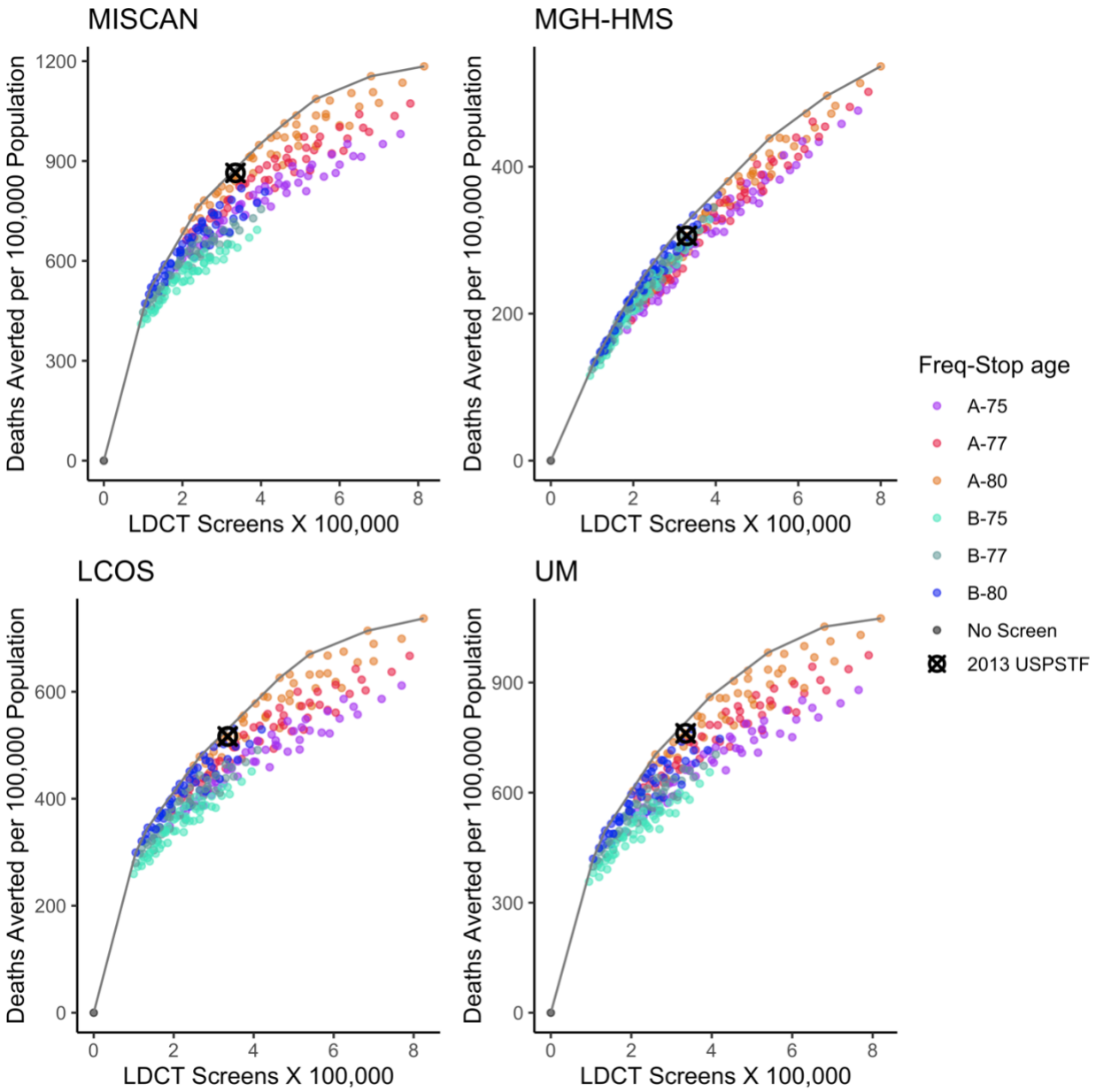
eFigure 2. Number of LDCT Screening Examinations vs. the Life-Years Gained in Each of the Risk Factor–Based and Risk Model–Based Eligibility Strategies Evaluated by the Four CISNET Models—1960 Birth Cohort



Note: Risk factor–based screening scenarios (n=288) are represented with triangle points and risk model–based screening scenarios (n=804) with round points. The line represents the estimated overall efficient frontier per model. Risk factor–based strategies vary by age at starting and stopping screening, frequency, pack-years criterion, and years since quitting smoking (eTable 2). Risk model–based strategies vary by risk model, risk thresholds, and frequency (eTable 2). The colors differentiate strategies by frequency (annual–A vs. biennial–B). The no-screening (black dot) and the 2013 USPSTF-recommended ("⊗" mark) scenarios are highlighted. Four CISNET lung cancer screening simulation models from different institutions were used for the analysis: Microsimulation Screening Analysis (MISCAN)-Lung Model from Erasmus University Medical Center, Massachusetts General Hospital–Harvard Medical School (MGH-HMS), the Lung Cancer Outcomes Simulation (LCOS) from Stanford University, and University of Michigan (UM).

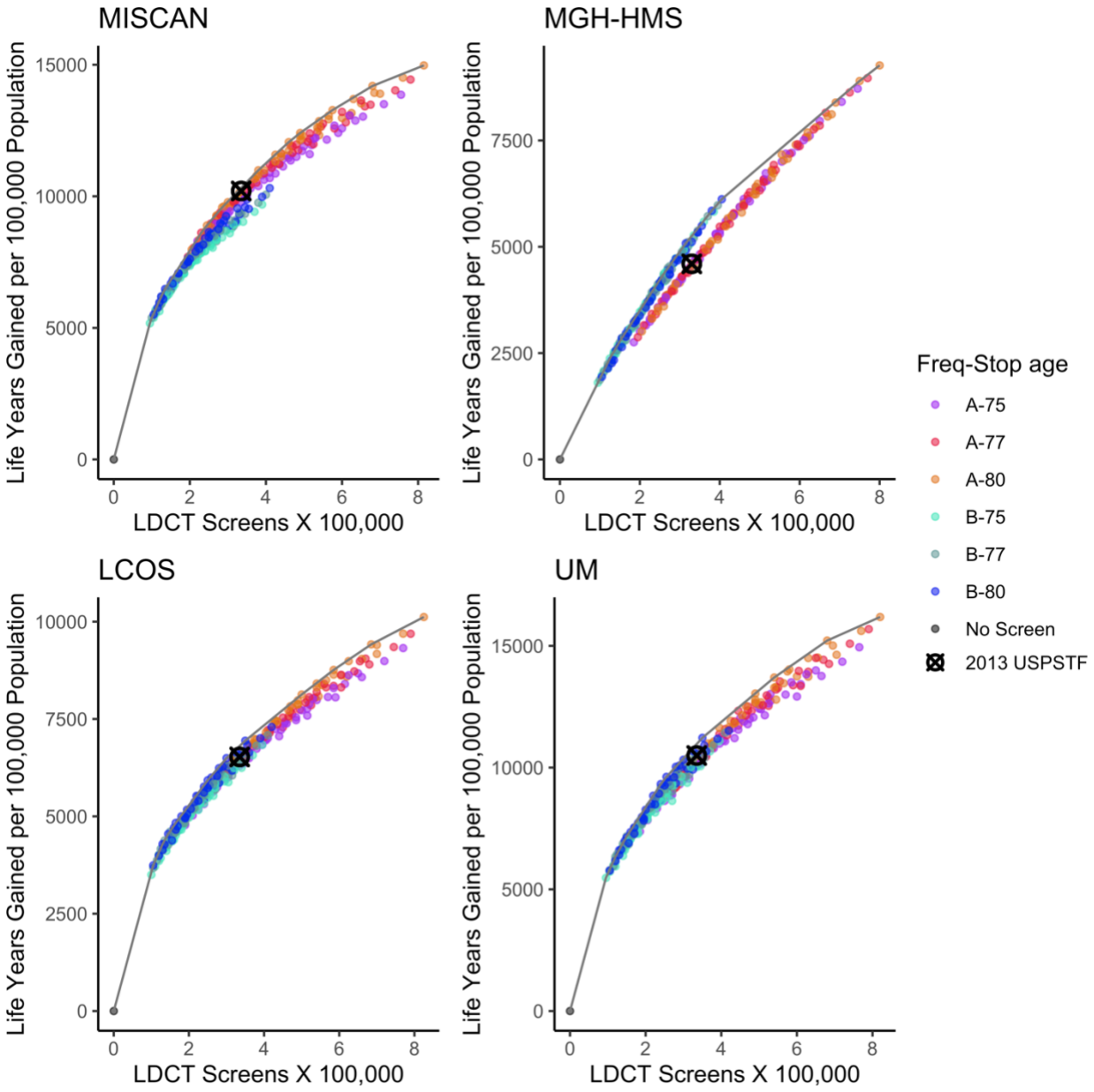
Abbreviations: CISNET=Cancer Intervention and Surveillance Modeling Network; LDCT=low-dose computed tomography; USPSTF=U.S. Preventive Services Task Force.

eFigure 3. Number of LDCT Screening Examinations vs. the Number of Lung Cancer Deaths Averted in Each of the 288 Risk Factor–Based Strategies Evaluated by the Four CISNET Models—1950 Birth Cohort



Note: Each point represents a different scenario, and the line represents the estimated efficient frontier per model. Strategies vary by age at starting and stopping screening, frequency, pack-years criterion, and years since quitting (eTable 2). The colors differentiate strategies by frequency (annual–A vs. biennial–B) and the age at stopping screening (75, 77, 80 years). The no-screening (black dot) and the 2013 USPSTF-recommended ("⊗" mark) scenarios are highlighted. Four CISNET lung cancer screening simulation models from different institutions were used for the analysis: Microsimulation Screening Analysis (MISCAN)-Lung Model from Erasmus University Medical Center, Massachusetts General Hospital–Harvard Medical School (MGH-HMS), the Lung Cancer Outcomes Simulation (LCOS) from Stanford University, and University of Michigan (UM).
Abbreviations: CISNET=Cancer Intervention and Surveillance Modeling Network; LDCT=low-dose computed tomography; USPSTF=U.S. Preventive Services Task Force; vs=versus.

eFigure 4. Number of LDCT Screening Examinations vs. Life-Years Gained in Each of the 288 Risk Factor–Based Strategies Evaluated by the Four CISNET Models—1950 Birth Cohort



Note: Each point represents a different scenario, and the line represents the estimated efficient frontier per model. Strategies vary by age at starting and stopping screening, frequency, pack-years criterion, and years since quitting (eTable 2). The colors differentiate strategies by frequency (annual–A vs. biennial–B) and the age at stopping screening (75, 77, 80 years). The no-screening (black dot) and the 2013 USPSTF-recommended ("⊗" mark) scenarios are highlighted. Four CISNET lung cancer screening simulation models from different institutions were used for the analysis: Microsimulation Screening Analysis (MISCAN)-Lung Model from Erasmus University Medical Center, Massachusetts General Hospital–Harvard Medical School (MGH-HMS), the Lung Cancer Outcomes Simulation (LCOS) from Stanford University, and University of Michigan (UM).
Abbreviations: CISNET=Cancer Intervention and Surveillance Modeling Network; LDCT=low-dose computed tomography; USPSTF=U.S. Preventive Services Task Force; vs.=versus.

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