A.



B.



Supplementary Figure S1: The predicted and observed incidence of ESCC in Yancheng, Yanting and Cixian County (A) and the validation tests of predicted versus observed incidence (B). In the figure B, the black solid line indicates the linear regression.



Supplementary Figure S2: The impact of screening strategies on the incidence of ESCC.



Supplementary Figure S3: The impact of adherence to screening on life years (A) and QALYs (B)



Supplementary Figure S4: The number of lesions needed to prevent a cancer in all 36 strategies.

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| Supplementary Table S1: Base-case health benefits and economic outcomes of different screening strategies |
| Strategies | Life time incidence of ESCC | LYs | QALYs | Cost ($) | ICER\* |
| TNM I | TNM II | TNM III | TNM IV | Total |
| No screening (reference strategy) | 1.14% | 5.05% | 4.91% | 2.66% | 13.75% | 59.52  | 19.45  | 83.97  | NA |
| Screening starting at 30 years old |  |  |  |  |  |  |  |  |  |
| Every 1 year | 0.88% | 1.25% | 1.07% | 0.54% | 3.74% | 60.70  | 19.54  | 138.54  | 638  |
| Every 3 year | 1.25% | 2.23% | 2.03% | 1.07% | 6.58% | 60.41  | 19.52  | 83.85  | -2  |
| Every 5 year | 1.33% | 2.82% | 2.61% | 1.39% | 8.16% | 60.22  | 19.50  | 79.27  | -94  |
| Every 10 year | 1.32% | 3.76% | 3.56% | 1.91% | 10.56% | 59.95  | 19.48  | 80.61  | -109  |
| Life time once | 1.14% | 5.04% | 4.89% | 2.65% | 13.71% | 59.54  | 19.45  | 88.86  | 2591  |
| Screening starting at 35 years old |  |  |  |  |  |  |  |  |  |
| Every 1 year | 0.90% | 1.27% | 1.09% | 0.55% | 3.80% | 60.68  | 19.54  | 112.88  | 346  |
| Every 3 year | 1.29% | 2.09% | 1.88% | 0.99% | 6.25% | 60.41  | 19.52  | 75.47  | -135  |
| Every 5 year | 1.34% | 2.83% | 2.62% | 1.40% | 8.19% | 60.21  | 19.50  | 74.18  | -200  |
| Every 10 year | 1.40% | 3.51% | 3.30% | 1.77% | 9.99% | 59.98  | 19.48  | 76.78  | -224  |
| Life time once | 1.14% | 5.00% | 4.85% | 2.63% | 13.62% | 59.56  | 19.46  | 86.77  | 698  |
| Screening starting at 40 years old |  |  |  |  |  |  |  |  |  |
| Every 1 year | 0.94% | 1.32% | 1.13% | 0.58% | 3.97% | 60.65  | 19.53  | 94.24  | 129  |
| Every 3 year | 1.30% | 2.21% | 2.00% | 1.06% | 6.57% | 60.37  | 19.51  | 70.28  | -233  |
| Every 5 year | 1.35% | 2.86% | 2.65% | 1.41% | 8.28% | 60.19  | 19.50  | 70.91  | -282  |
| Every 10 year | 1.32% | 3.78% | 3.58% | 1.92% | 10.60% | 59.94  | 19.48  | 75.66  | -284  |
| Life time once | 1.14% | 4.91% | 4.76% | 2.57% | 13.38% | 59.61  | 19.46  | 84.08  | 13  |
| Screening starting at 45 years old |  |  |  |  |  |  |  |  |  |
| Every 1 year | 1.07% | 1.46% | 1.26% | 0.65% | 4.43% | 60.56  | 19.52  | 82.46  | -21  |
| Every 3 year | 1.34% | 2.41% | 2.20% | 1.17% | 7.12% | 60.29  | 19.50  | 68.40  | -304  |
| Every 5 year | 1.38% | 2.95% | 2.73% | 1.46% | 8.52% | 60.14  | 19.49  | 69.83  | -344  |
| Every 10 year | 1.41% | 3.55% | 3.35% | 1.80% | 10.11% | 59.95  | 19.48  | 73.83  | -356  |
| Life time once | 1.15% | 4.72% | 4.56% | 2.46% | 12.90% | 59.68  | 19.47  | 80.77  | -249  |
| Screening starting at 50 years old |  |  |  |  |  |  |  |  |  |
| Every 1 year | 1.27% | 1.76% | 1.53% | 0.80% | 5.37% | 60.40  | 19.51  | 77.33  | -117  |
| Every 3 year | 1.47% | 2.51% | 2.30% | 1.23% | 7.51% | 60.17  | 19.49  | 69.60  | -354  |
| Every 5 year | 1.43% | 3.14% | 2.93% | 1.57% | 9.07% | 60.03  | 19.48  | 71.37  | -389  |
| Every 10 year | 1.34% | 3.90% | 3.70% | 1.99% | 10.92% | 59.87  | 19.47  | 75.24  | -391  |
| Life time once | 1.20% | 4.52% | 4.35% | 2.34% | 12.41% | 59.73  | 19.47  | 78.85  | -349  |
| Screening starting at 55 years old |  |  |  |  |  |  |  |  |  |
| Every 1 year | 1.49% | 2.25% | 2.00% | 1.07% | 6.82% | 60.18  | 19.49  | 76.71  | -184  |
| Every 3 year | 1.53% | 3.01% | 2.79% | 1.50% | 8.83% | 59.98  | 19.48  | 73.22  | -398  |
| Every 5 year | 1.47% | 3.47% | 3.26% | 1.75% | 9.95% | 59.89  | 19.47  | 74.58  | -430  |
| Every 10 year | 1.44% | 3.83% | 3.63% | 1.96% | 10.85% | 59.81  | 19.47  | 76.52  | -439  |
| Life time once | 1.27% | 4.39% | 4.20% | 2.27% | 12.12% | 59.72  | 19.46  | 78.74  | -412  |
| Screening starting at 60 years old |  |  |  |  |  |  |  |  |  |
| Every 1 year | 1.64% | 2.89% | 2.64% | 1.42% | 8.59% | 59.95  | 19.48  | 78.18  | -247  |
| Every 3 year | 1.54% | 3.62% | 3.41% | 1.85% | 10.42% | 59.80  | 19.47  | 77.34  | -447  |
| Every 5 year | 1.47% | 3.90% | 3.70% | 2.00% | 11.06% | 59.75  | 19.46  | 78.17  | -472  |
| Every 10 year | 1.33% | 4.35% | 4.16% | 2.25% | 12.09% | 59.68  | 19.46  | 79.80  | -470  |
| Life time once | 1.33% | 4.35% | 4.16% | 2.25% | 12.09% | 59.68  | 19.46  | 79.80  | -470  |
| \* Compared with no screening |  |  |  |  |  |  |  |  |  |

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| Supplementary Table S2: Base-case undiscounted costs of 36 screening programs. |
| Stragy\_name | Cost of screening | Cost of precancerous lesions treatment | Cost of cancer treatment | Total cost | Difference\* |
| No screening | 0.00 | 0.00 | 535.53 | 535.53 | - |
| 30 years initiation every 1 years | 636.51 | 96.31 | 89.40 | 822.22 | 286.69 |
| 30 years initiation every 3 years | 210.32 | 72.76 | 190.39 | 473.48 | -62.05 |
| 30 years initiation every 5 years | 133.61 | 58.35 | 255.93 | 447.89 | -87.64 |
| 30 years initiation every 10 years | 75.43 | 35.36 | 361.76 | 472.56 | -62.97 |
| Lifetime once at 30 years | 34.78 | 1.36 | 528.14 | 564.28 | 28.75 |
| 35 years initiation every 1 years | 470.54 | 94.81 | 96.86 | 662.20 | 126.67 |
| 35 years initiation every 3 years | 157.73 | 74.14 | 188.33 | 420.20 | -115.33 |
| 35 years initiation every 5 years | 98.81 | 57.49 | 260.46 | 416.76 | -118.77 |
| 35 years initiation every 10 years | 57.99 | 39.42 | 347.68 | 445.09 | -90.43 |
| Lifetime once at 35 years | 27.10 | 3.13 | 518.83 | 549.05 | 13.52 |
| 40 years initiation every 1 years | 341.04 | 91.33 | 113.87 | 546.24 | 10.72 |
| 40 years initiation every 3 years | 113.31 | 70.02 | 206.82 | 390.14 | -145.38 |
| 40 years initiation every 5 years | 71.67 | 55.49 | 270.82 | 397.98 | -137.55 |
| 40 years initiation every 10 years | 40.64 | 34.18 | 368.10 | 442.92 | -92.60 |
| Lifetime once at 40 years | 21.07 | 6.75 | 499.91 | 527.73 | -7.80 |
| 45 years initiation every 1 years | 240.08 | 83.88 | 150.08 | 474.04 | -61.49 |
| 45 years initiation every 3 years | 78.33 | 62.57 | 241.89 | 382.80 | -152.73 |
| 45 years initiation every 5 years | 50.52 | 51.15 | 293.10 | 394.76 | -140.76 |
| 45 years initiation every 10 years | 30.86 | 36.69 | 362.11 | 429.67 | -105.86 |
| Lifetime once at 45 years | 16.30 | 12.31 | 471.33 | 499.94 | -35.59 |
| 50 years initiation every 1 years | 161.58 | 71.02 | 213.44 | 446.04 | -89.49 |
| 50 years initiation every 3 years | 54.90 | 54.74 | 286.23 | 395.87 | -139.66 |
| 50 years initiation every 5 years | 34.08 | 43.15 | 334.15 | 411.39 | -124.14 |
| 50 years initiation every 10 years | 19.52 | 28.29 | 398.96 | 446.77 | -88.76 |
| Lifetime once at 50 years | 12.50 | 15.79 | 454.86 | 483.15 | -52.38 |
| 55 years initiation every 1 years | 101.23 | 54.70 | 294.44 | 450.37 | -85.16 |
| 55 years initiation every 3 years | 33.59 | 40.48 | 355.88 | 429.96 | -105.57 |
| 55 years initiation every 5 years | 21.45 | 32.70 | 387.61 | 441.75 | -93.78 |
| 55 years initiation every 10 years | 14.46 | 25.88 | 418.40 | 458.74 | -76.79 |
| Lifetime once at 55 years | 9.43 | 16.14 | 456.61 | 482.18 | -53.35 |
| 60 years initiation every 1 years | 55.90 | 37.93 | 376.49 | 470.32 | -65.21 |
| 60 years initiation every 3 years | 17.26 | 25.96 | 425.31 | 468.52 | -67.00 |
| 60 years initiation every 5 years | 11.93 | 21.77 | 441.99 | 475.70 | -59.83 |
| 60 years initiation every 10 years | 6.95 | 14.32 | 470.79 | 492.07 | -43.46 |
| Lifetime once at 60 years | 6.95 | 14.32 | 470.79 | 492.07 | -43.46 |
| \* Compared with no screening. |