A: Datasheet

Algorithm: pixelall_005

Developer: Guangzhou Pixel Solutions Co Ltd

Submission Date: 2021_03_23

Template size: 2560 bytes

Template time (2.5 percentile): 836 msec

Template time (median): 840 msec

Template time (97.5 percentile): 872 msec

Investigation:

Frontal mugshot ranking 31 (out of 280) −− FNIR(1600000, 0, 1) = 0.0019 vs. lowest 0.0009 from sensetime_005

Mugshot webcam ranking 24 (out of 242) −− FNIR(1600000, 0, 1) = 0.0108 vs. lowest 0.0062 from sensetime_005

Mugshot profile ranking 32 (out of 211) −− FNIR(1600000, 0, 1) = 0.2642 vs. lowest 0.0587 from xforwardai_002

Immigration visa−border ranking 77 (out of 169) −− FNIR(1600000, 0, 1) = 0.0120 vs. lowest 0.0013 from visionlabs_010

Immigration visa−kiosk ranking 74 (out of 166) −− FNIR(1600000, 0, 1) = 0.1458 vs. lowest 0.0568 from cloudwalk_hr_000

Identification:

Frontal mugshot ranking 22 (out of 280) −− FNIR(1600000, T, L+1) = 0.0120, FPIR=0.001000 vs. lowest 0.0018 from sensetime_004

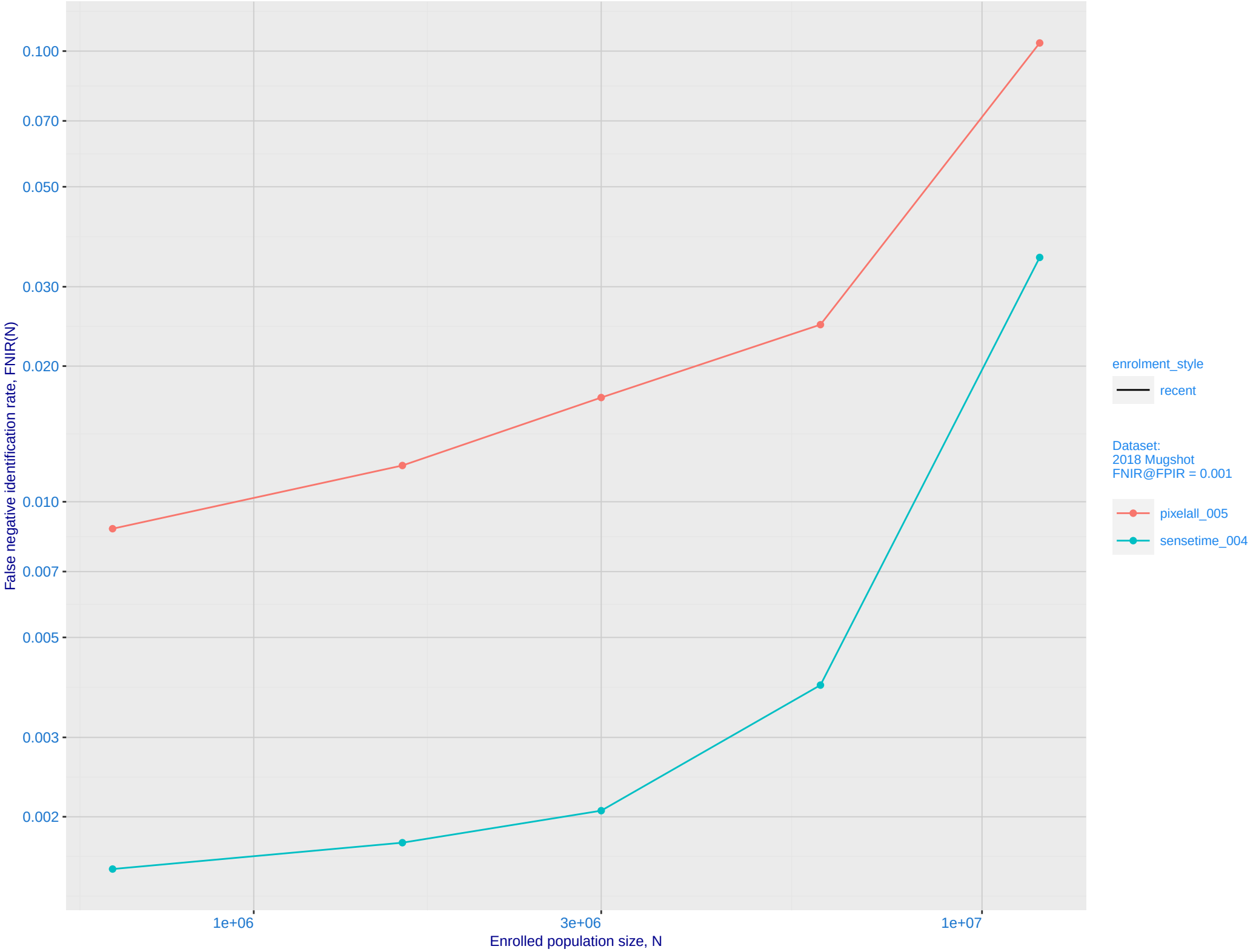
Mugshot webcam ranking 28 (out of 236) −− FNIR(1600000, T, L+1) = 0.0497, FPIR=0.001000 vs. lowest 0.0122 from sensetime_003

Mugshot profile ranking 188 (out of 210) −− FNIR(1600000, T, L+1) = 0.9999, FPIR=0.001000 vs. lowest 0.1331 from cloudwalk_hr_000

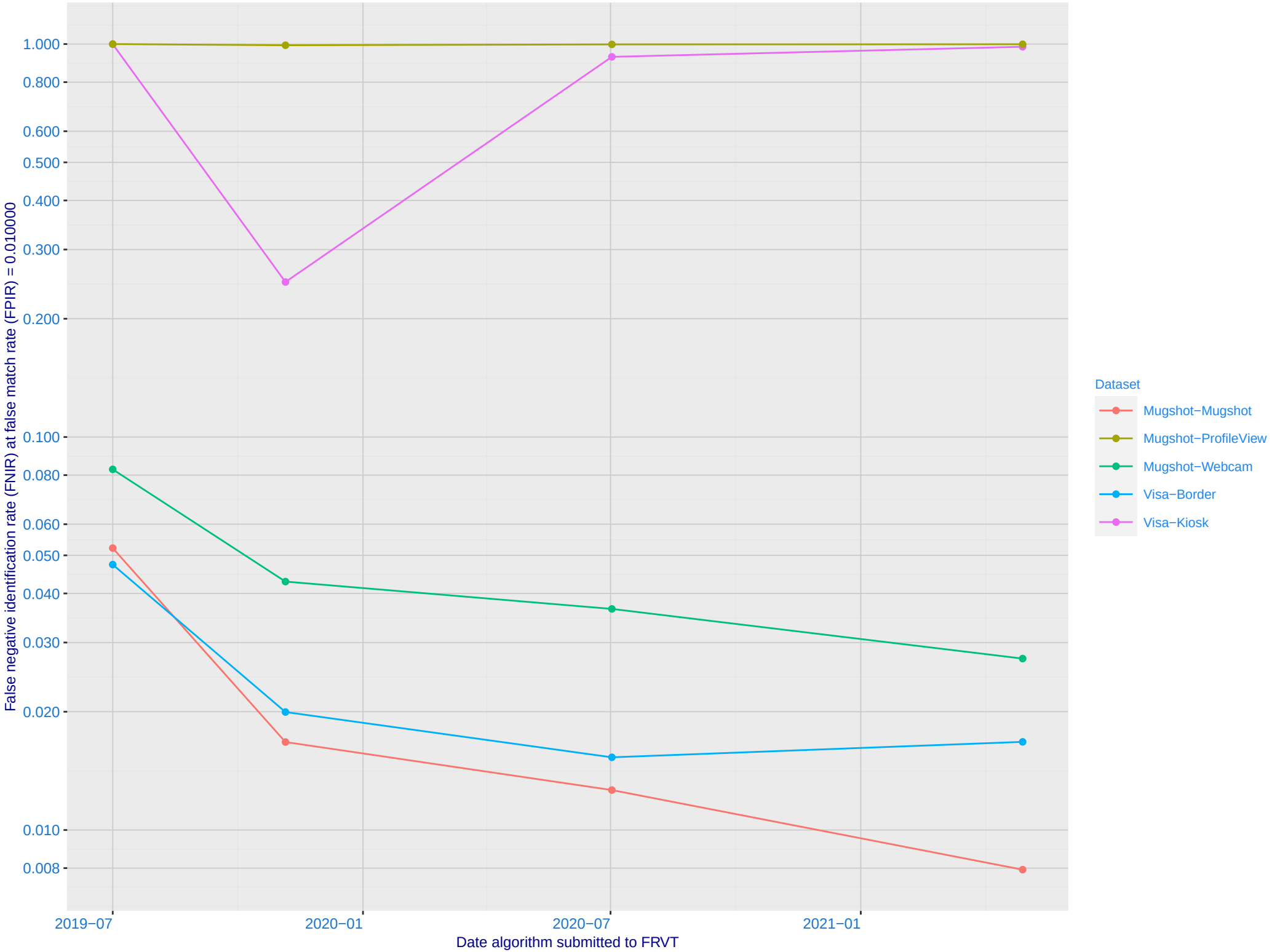
Immigration visa−border ranking 29 (out of 168) −− FNIR(1600000, T, L+1) = 0.0269, FPIR=0.001000 vs. lowest 0.0047 from idemia_008

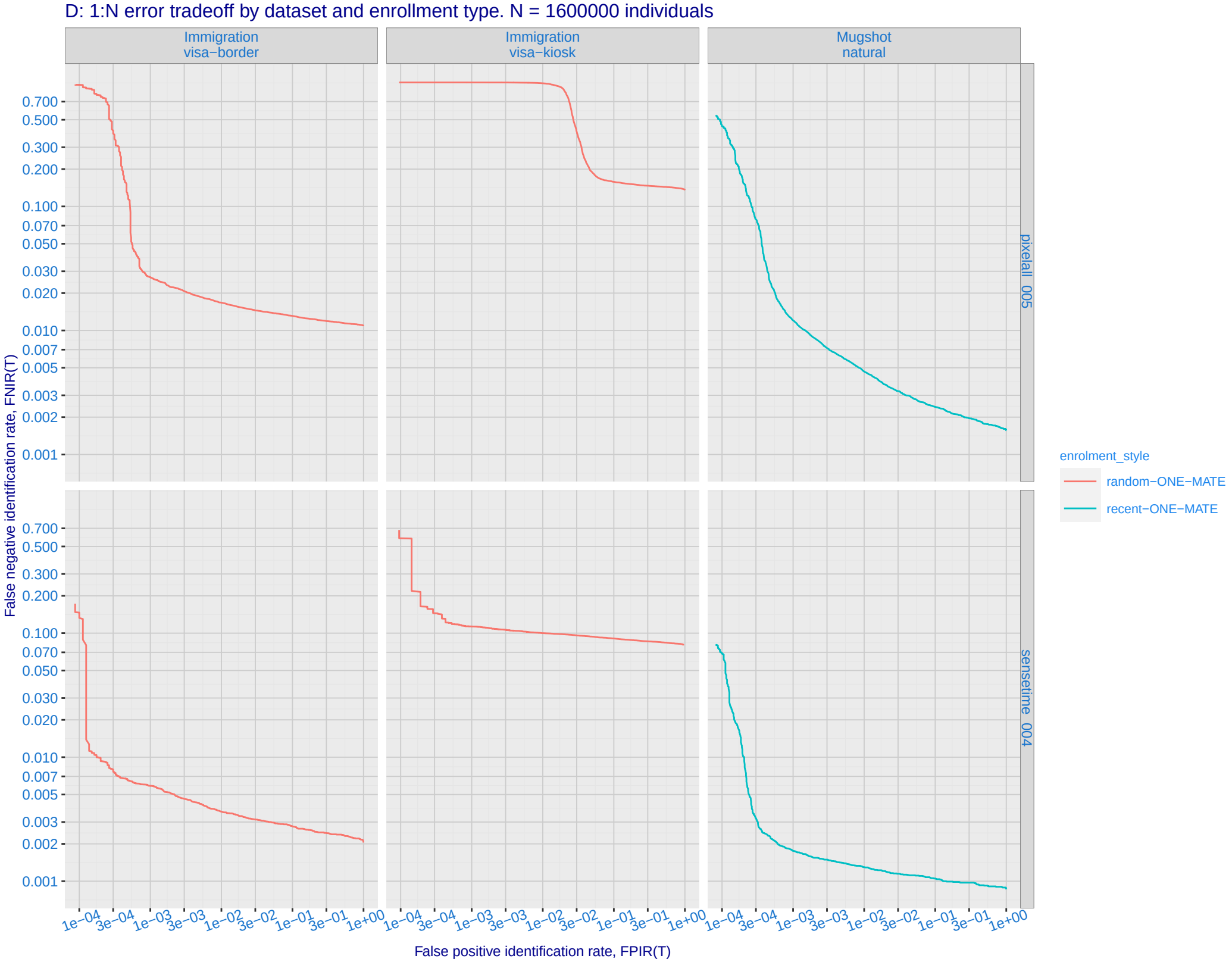
Immigration visa−kiosk ranking 146 (out of 163) −− FNIR(1600000, T, L+1) = 0.9997, FPIR=0.001000 vs. lowest 0.0996 from cloudwalk_hr_000

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (sensetime_004)

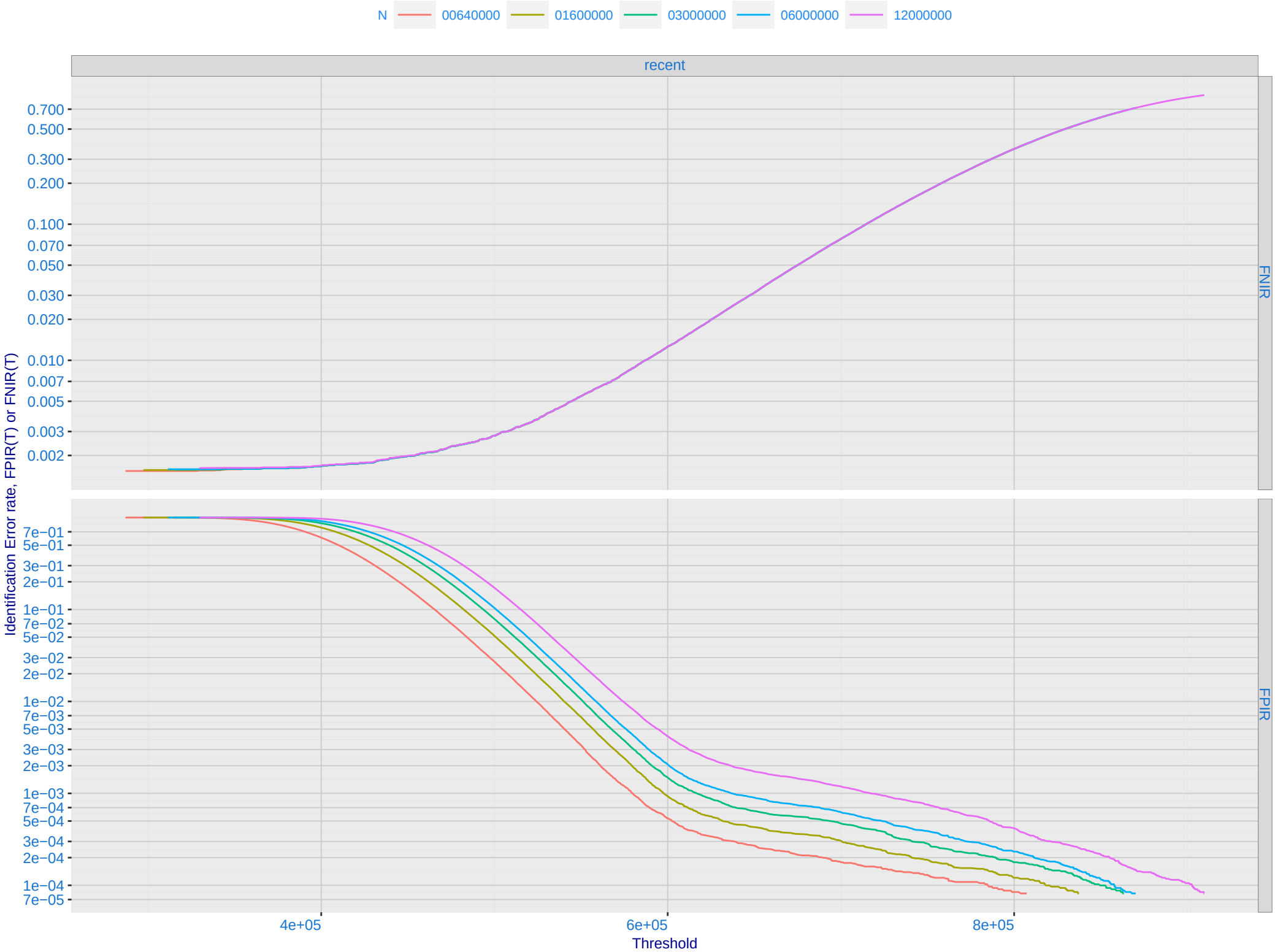


C: Evolution of accuracy for PIXELALL algorithms on three datasets 2018 − present

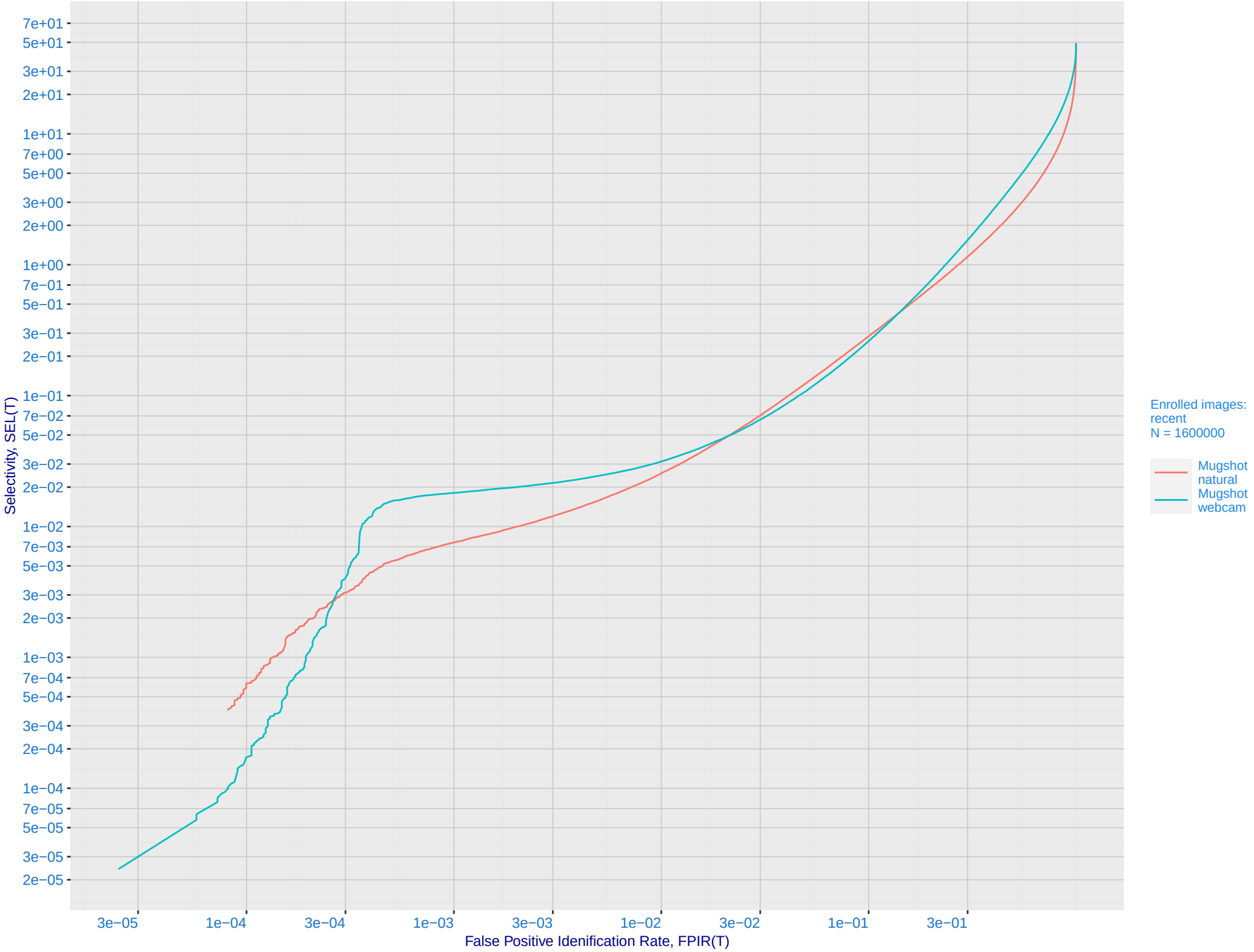


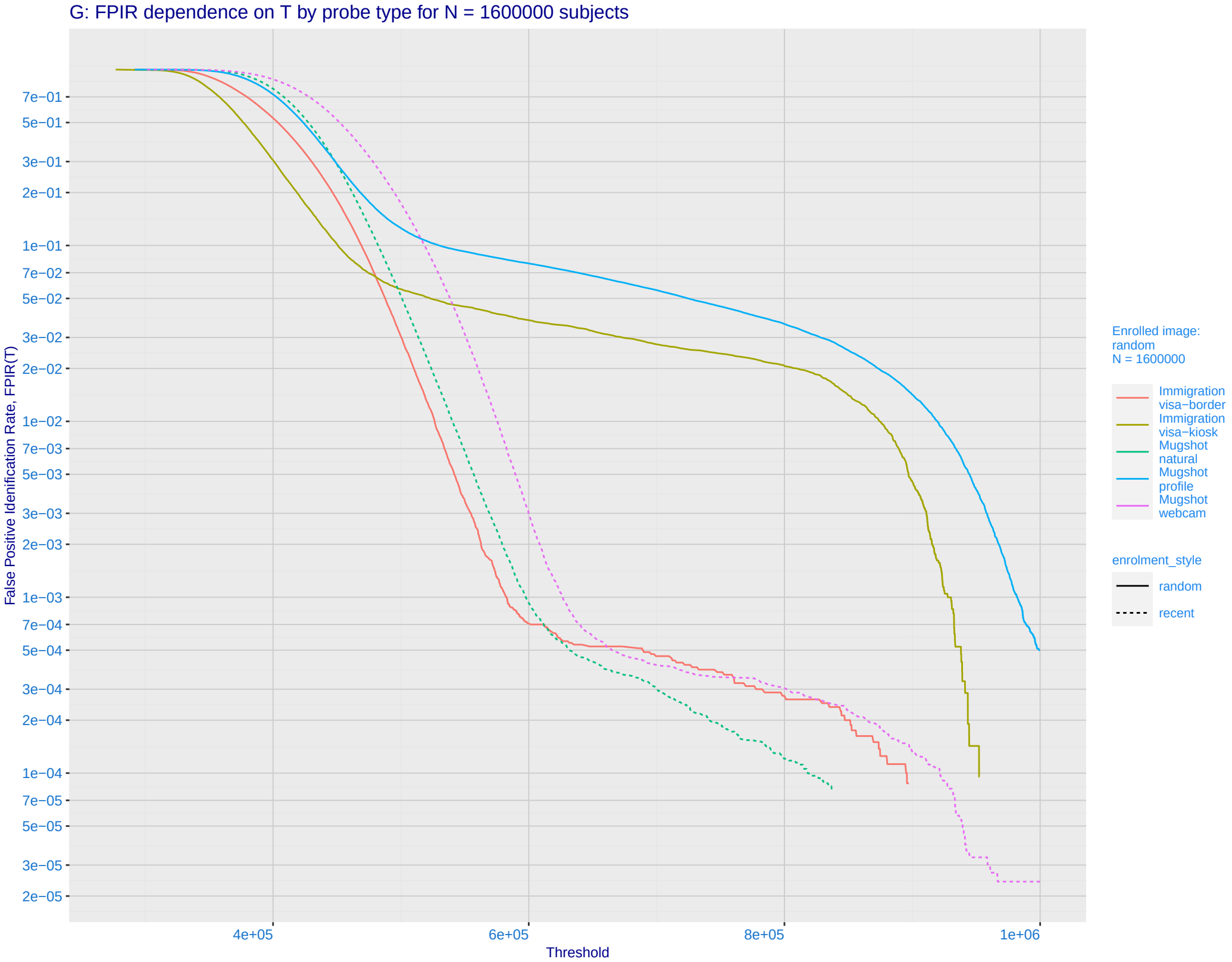

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
pixelall_005
sensetime_004
False negative identification rate, FNIR(T)
False positive identification rate, FPIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
1e+00
enrolment_style
random−ONE−MATE
recent−ONE−MATE

E: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images

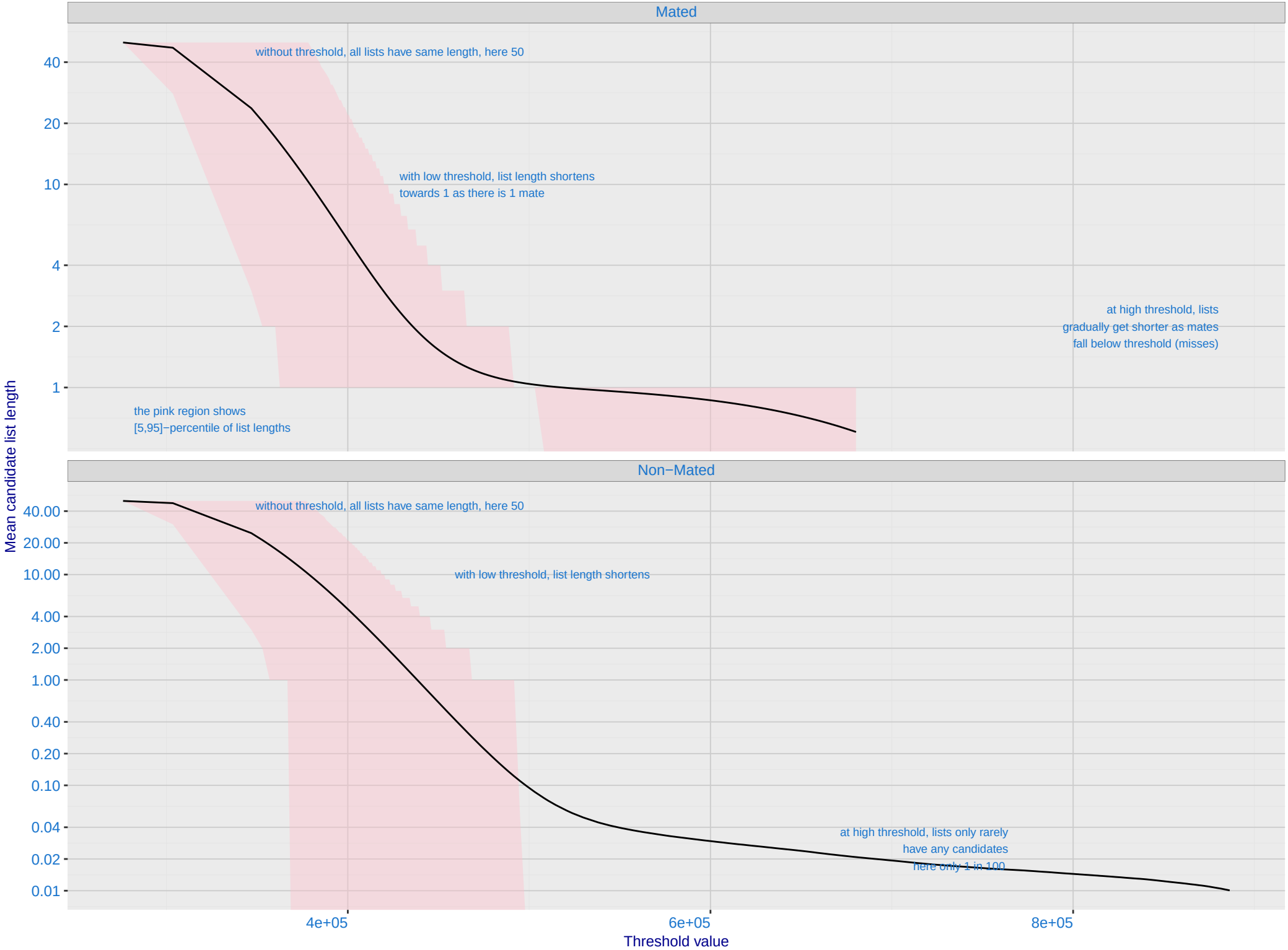


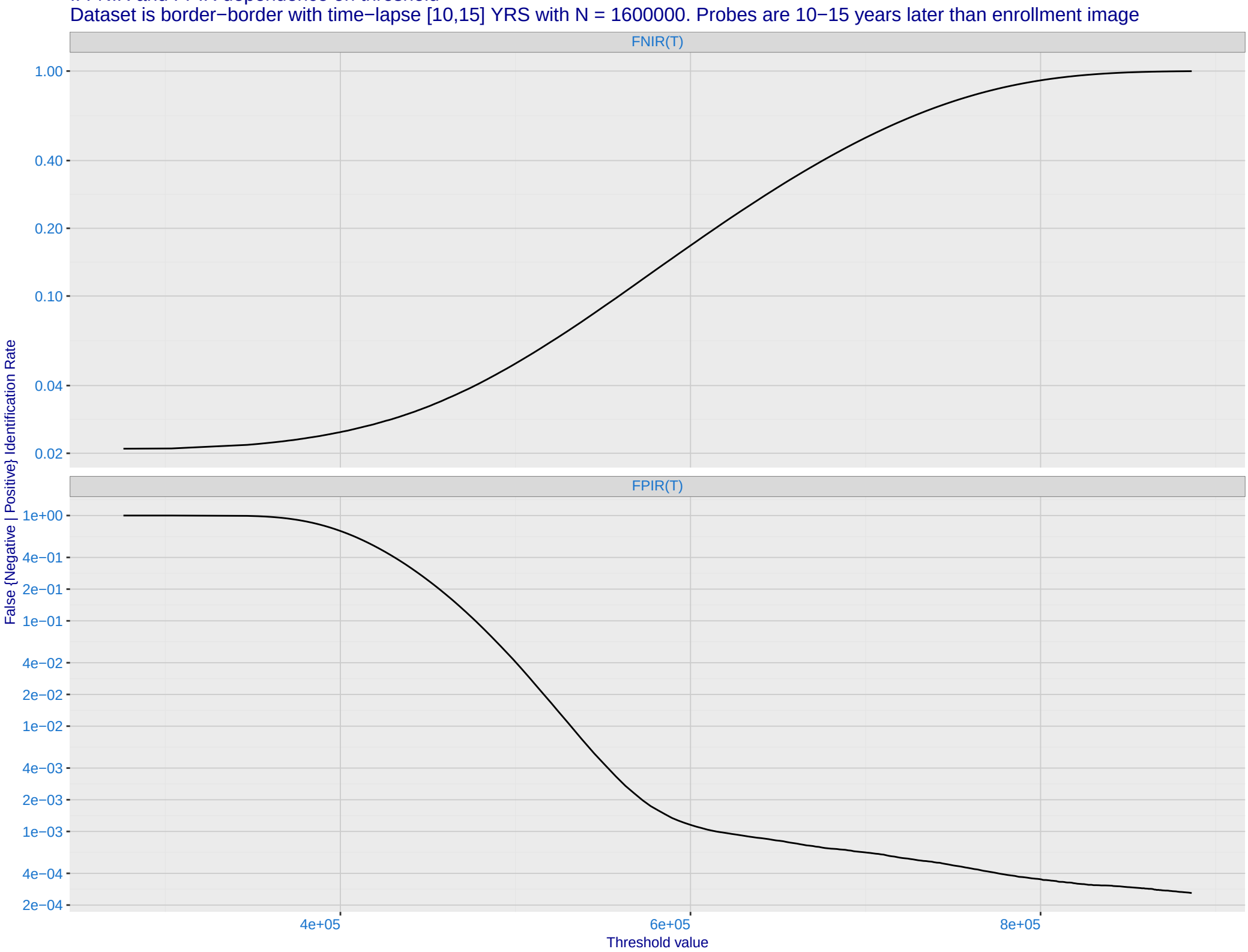
F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate



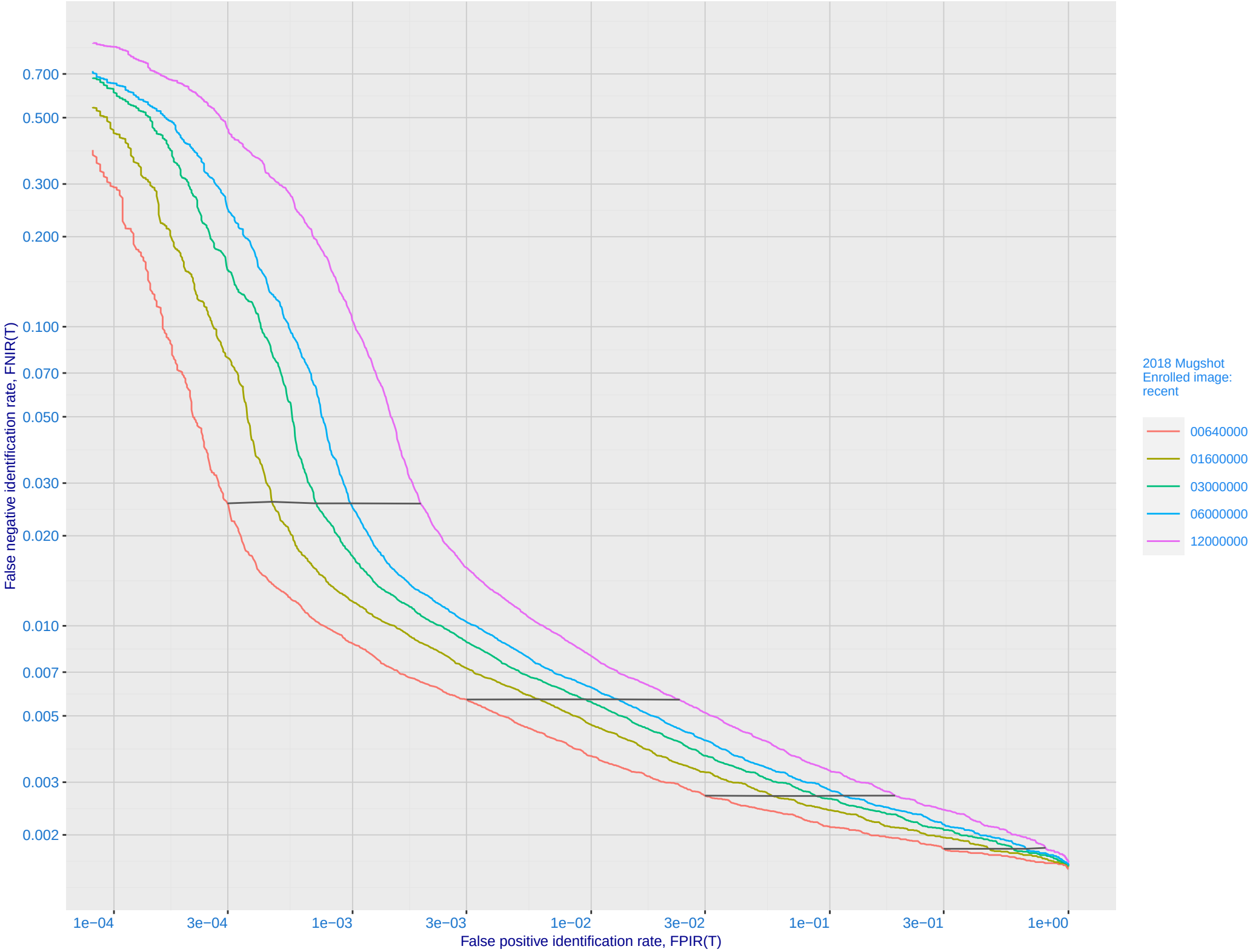

G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Idenification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
4e+05
6e+05
8e+05
1e+06
Threshold
Enrolled image:
random
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot profile
Mugshot webcam
enrolment_style
random
recent

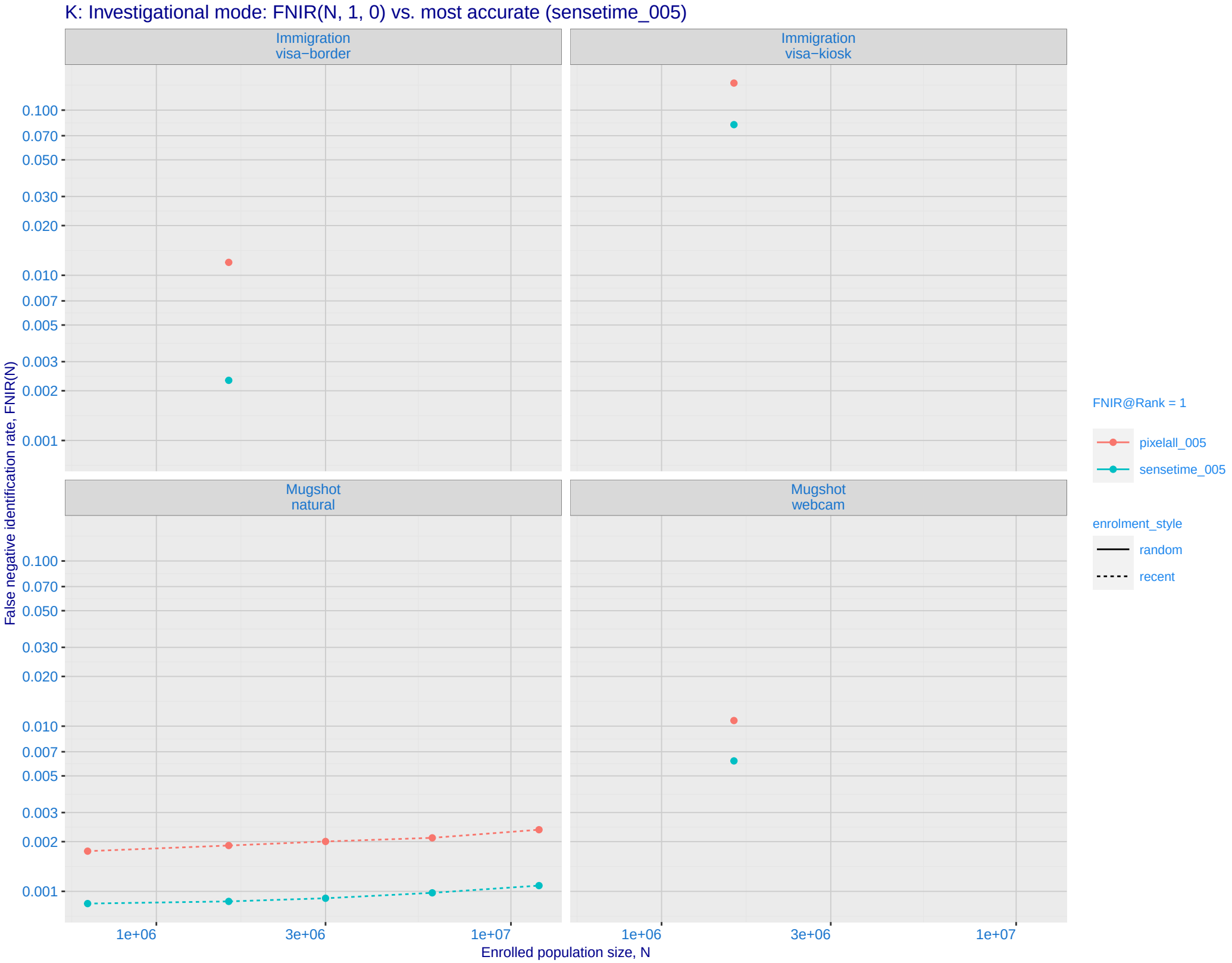
H: Reduced length candidate lists for human review
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image

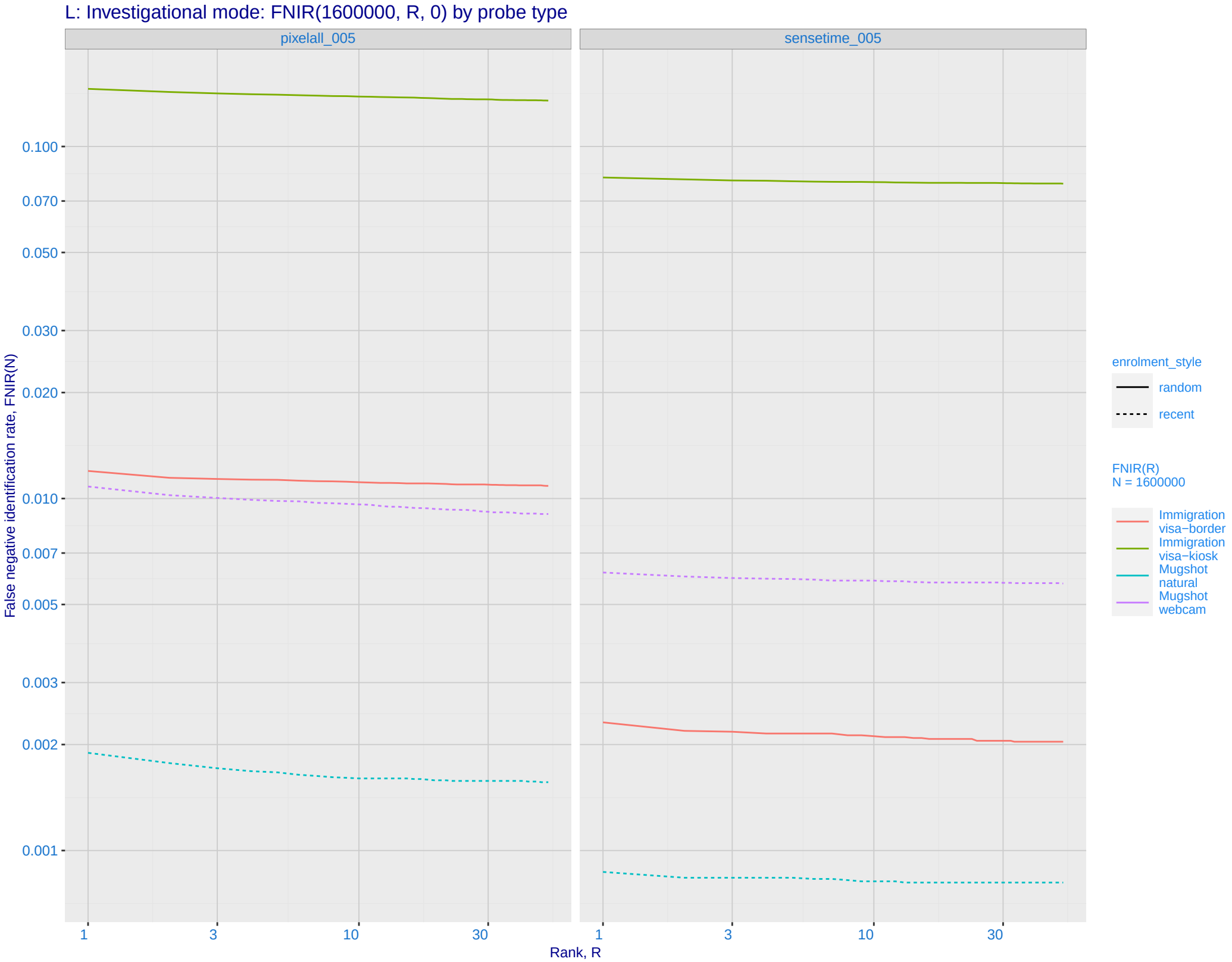



I: FNIR and FPIR dependence on threshold
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
FNIR(T)
FPIR(T)
False {Negative | Positive} Identification Rate
1.00
0.40
0.20
0.10
0.04
0.02
1e+00
4e−01
2e−01
1e−01
4e−02
2e−02
1e−02
4e−03
2e−03
1e−03
4e−04
2e−04
4e+05
6e+05
8e+05
Threshold value

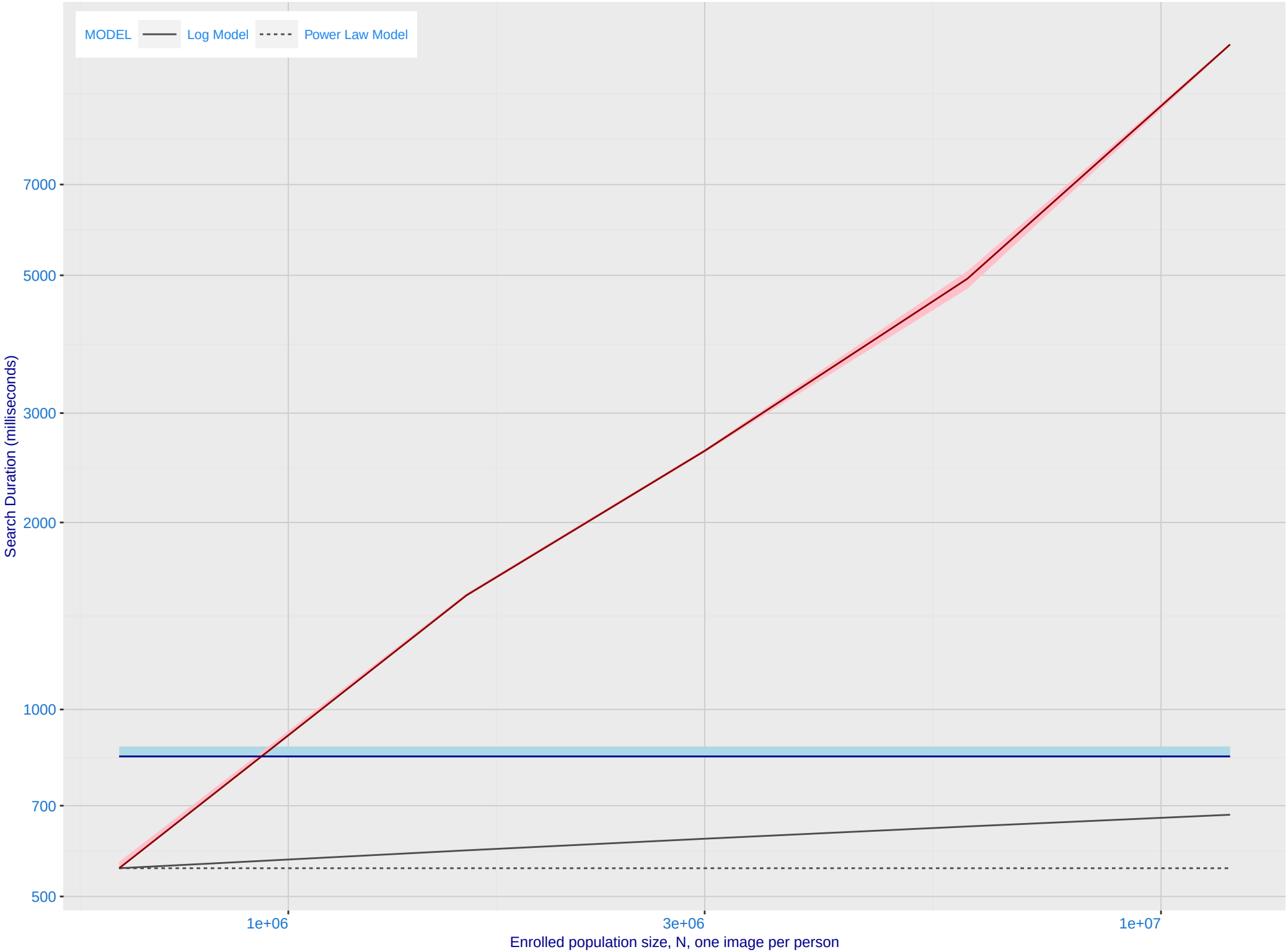
J: DET for Mugshot natural images and various N. Links connect points of equal threshold.




K: Investigational mode: FNIR(N, 1, 0) vs. most accurate (sensetime_005)
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam
False negative identification rate, FNIR(N)
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e+06
3e+06
1e+07
Enrolled population size, N
FNIR@Rank = 1
pixelall_005
sensetime_005
enrolment_style
random
recent


L: Investigational mode: FNIR(1600000, R, 0) by probe type
pixelall_005
sensetime_005
False negative identification rate, FNIR(N)
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1
3
10
30
Rank, R
enrolment_style
random
recent
FNIR(R)
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam

M: Template duration; search duration vs. N. The blue and pink ribbon covers 95 percent of observed measurements.
The template generation time is independent of N. The log and power−law models are fit to the first two (N,T) observations



O: FNIR(T, N = 1.6 million) by sex, age and time−lapse. The top row gives investigational rank−1 miss rates.
The bottom panels give high threshold for more lights−out identification with low FPIR.

Algorithm: pixelall_005, Dataset: Border−Crossing Ageing N = 1600000
Text encodes FNIR, Color encodes log(FNIR)

−3 −2 −1

Female

Age group at time of enrollment	10	11	12	13	14	15
(60:99]	0.025	0.025	0.026	0.026	0.030	0.029
(45:60]	0.023	0.023	0.023	0.025	0.027	0.028
(30:45]	0.031	0.029	0.031	0.033	0.032	0.030
(21:30]	0.035	0.034	0.036	0.038	0.042	0.039
(18:21]	0.040	0.043	0.045	0.052	0.045	0.041
(15:18]	0.058	0.052	0.052	0.054	0.055	0.055
(12:15]	0.070	0.055	0.061	0.068	0.078	0.059
(60:99]	0.222	0.226	0.265	0.284	0.322	0.395
(45:60]	0.218	0.227	0.257	0.290	0.314	0.324
(30:45]	0.270	0.281	0.307	0.344	0.366	0.377
(21:30]	0.335	0.340	0.369	0.404	0.420	0.429
(18:21]	0.464	0.465	0.484	0.525	0.529	0.515
(15:18]	0.557	0.547	0.568	0.600	0.623	0.572
(12:15]	0.649	0.650	0.663	0.681	0.709	0.701

Male

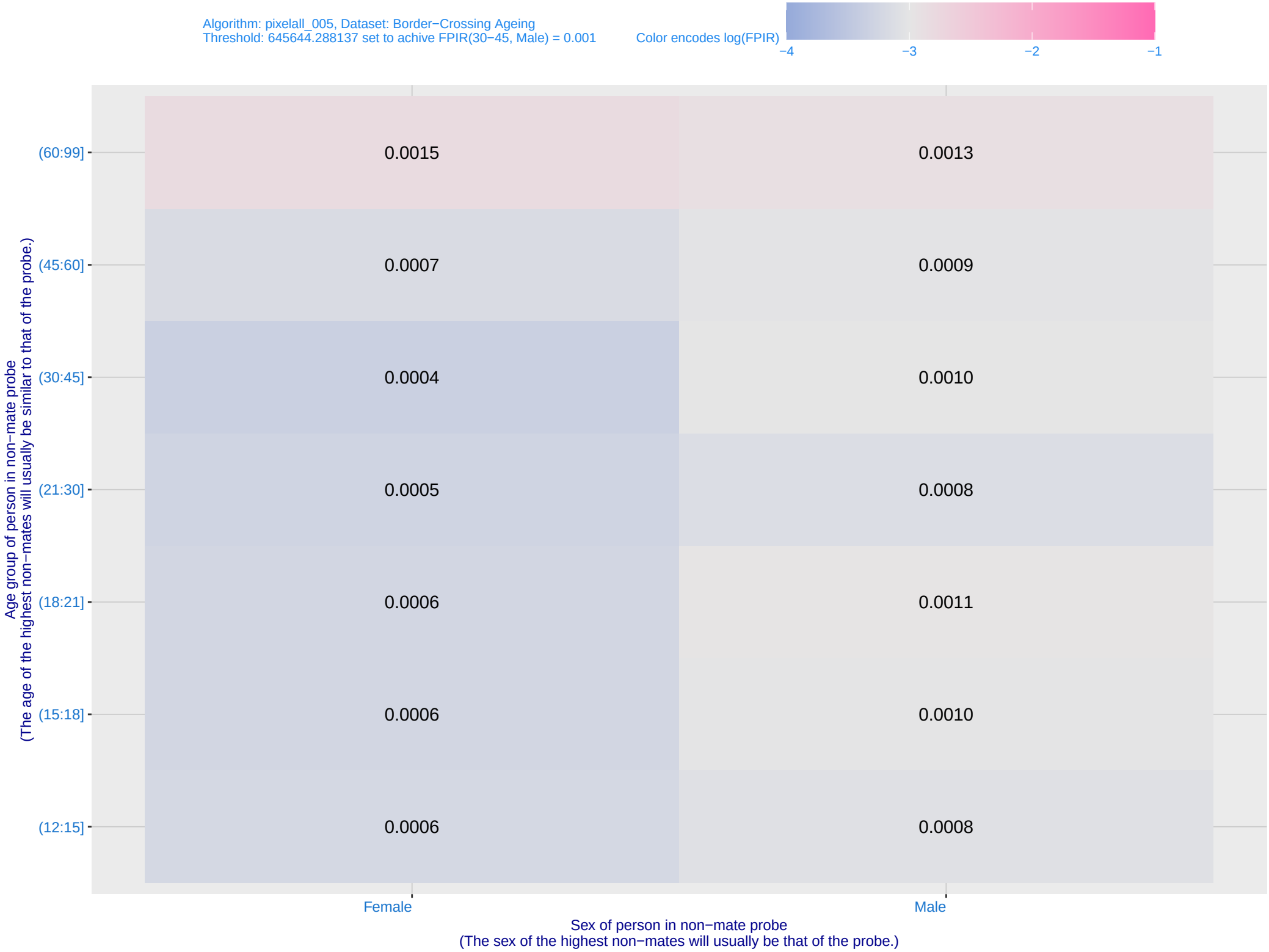
Age group at time of enrollment	10	11	12	13	14	15
(60:99]	0.022	0.022	0.021	0.024	0.024	0.030
(45:60]	0.021	0.020	0.020	0.021	0.023	0.018
(30:45]	0.021	0.020	0.021	0.022	0.022	0.018
(21:30]	0.021	0.020	0.021	0.022	0.025	0.024
(18:21]	0.022	0.025	0.028	0.027	0.030	0.025
(15:18]	0.044	0.040	0.039	0.052	0.046	0.064
(12:15]	0.069	0.067	0.081	0.080	0.089	0.072
(60:99]	0.139	0.146	0.164	0.192	0.196	0.215
(45:60]	0.129	0.134	0.158	0.184	0.199	0.196
(30:45]	0.145	0.146	0.173	0.207	0.226	0.229
(21:30]	0.213	0.221	0.253	0.290	0.325	0.315
(18:21]	0.439	0.428	0.462	0.508	0.556	0.537
(15:18]	0.638	0.643	0.686	0.719	0.758	0.787
(12:15]	0.781	0.784	0.820	0.843	0.863	0.833

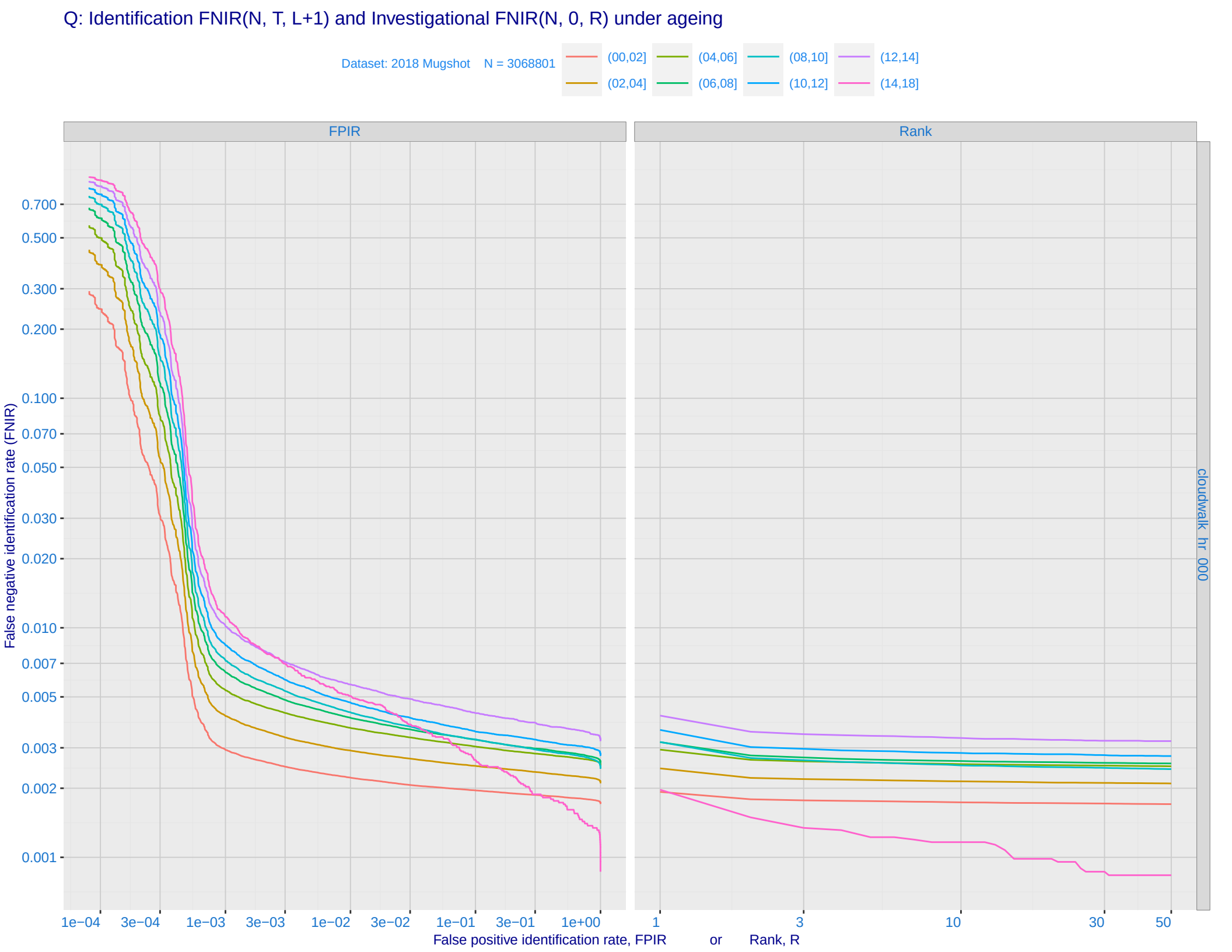
Time between probe and enrollment (years)

FNIR(R=1, T=0)

FNIR(R=50, T=645644.2881.37), FPIR(30−45, Male) = 0.00

P: FPIR(N = 1.6 million) by sex and age. It is typical for false positive identification rates to be higher in women except in their teens.




Q: Identification FNIR(N, T, L+1) and Investigational FNIR(N, 0, R) under ageing
Dataset: 2018 Mugshot N = 3068801
(00,02]
(02,04]
(04,06]
(06,08]
(08,10]
(10,12]
(12,14]
(14,18]
FPIR
Rank
cloudwalk_hr_000
False negative identification rate (FNIR)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
1e+00
1
3
10
30
50
False positive identification rate, FPIR or Rank, R