A: Datasheet

Algorithm: imagus_007

Developer: Imagus Technology Pty Ltd

Submission Date: 2021_11_16

Template size: 2048 bytes

Template time (2.5 percentile): 552 msec

Template time (median): 610 msec

Template time (97.5 percentile): 616 msec

Investigation:

Frontal mugshot ranking 63 (out of 322) −− FNIR(1600000, 0, 1) = 0.0020 vs. lowest 0.0009 from sensetime_006

Mugshot webcam ranking 65 (out of 284) −− FNIR(1600000, 0, 1) = 0.0131 vs. lowest 0.0057 from sensetime_006

Mugshot profile ranking 60 (out of 253) −− FNIR(1600000, 0, 1) = 0.3212 vs. lowest 0.0550 from sensetime_006

Immigration visa−border ranking 54 (out of 211) −− FNIR(1600000, 0, 1) = 0.0038 vs. lowest 0.0009 from sensetime_006

Immigration visa−kiosk ranking 82 (out of 208) −− FNIR(1600000, 0, 1) = 0.1174 vs. lowest 0.0487 from cubox_000

Identification:

Frontal mugshot ranking 78 (out of 322) −− FNIR(1600000, T, L+1) = 0.0227, FPIR=0.001000 vs. lowest 0.0018 from sensetime_004

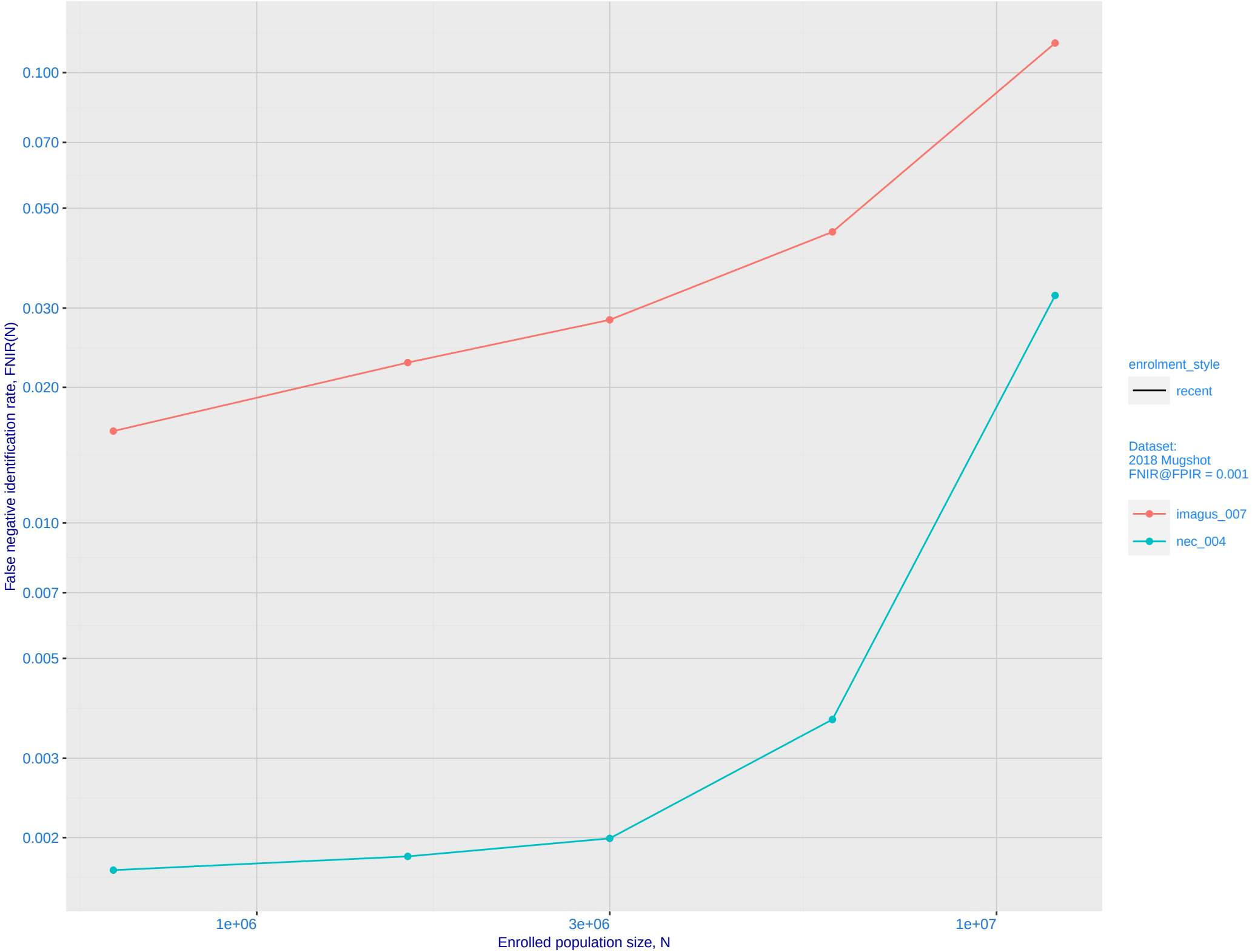
Mugshot webcam ranking 79 (out of 282) −− FNIR(1600000, T, L+1) = 0.0733, FPIR=0.001000 vs. lowest 0.0122 from sensetime_003

Mugshot profile ranking 48 (out of 252) −− FNIR(1600000, T, L+1) = 0.8929, FPIR=0.001000 vs. lowest 0.1331 from cloudwalk_hr_000

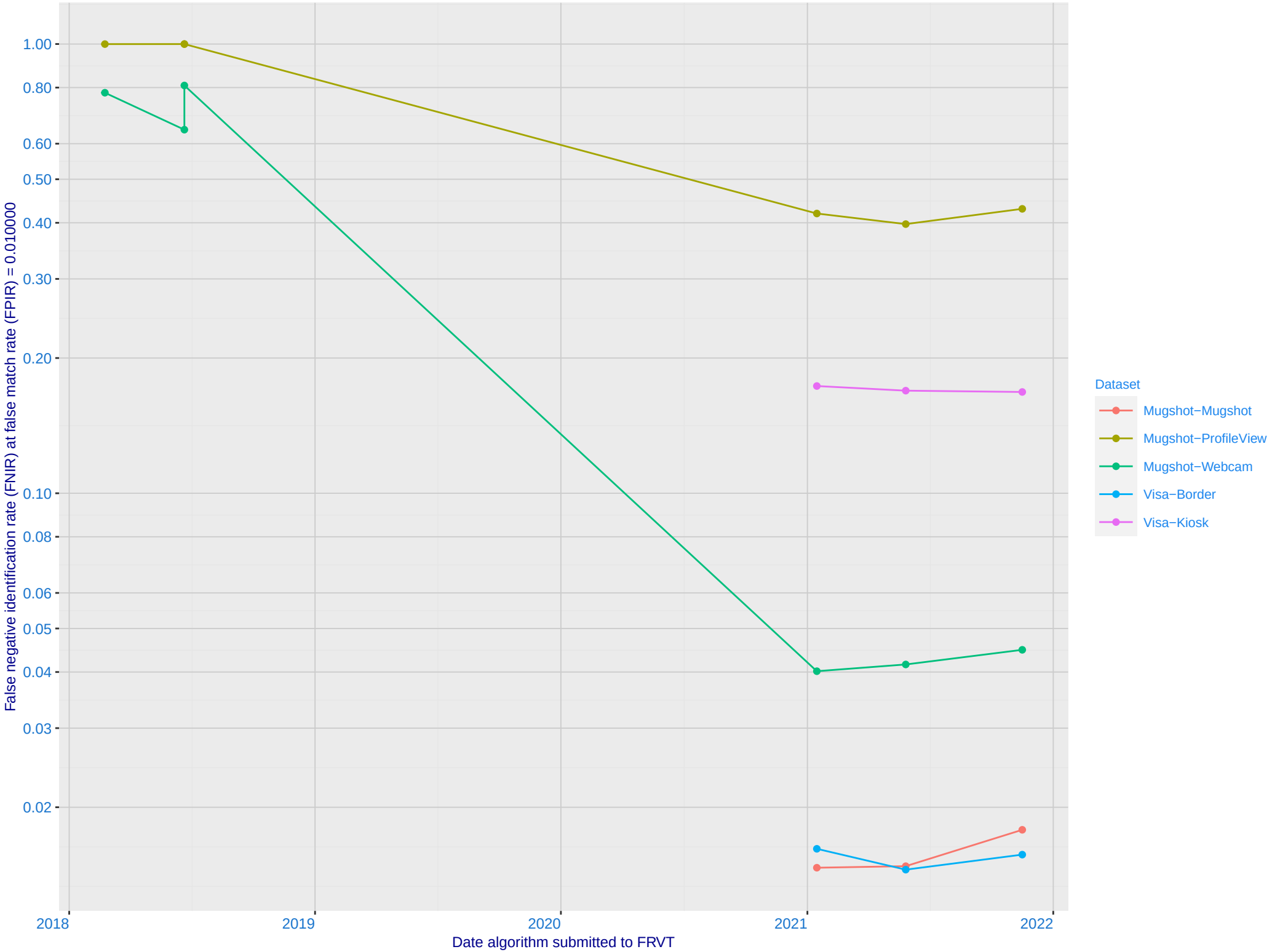
Immigration visa−border ranking 60 (out of 210) −− FNIR(1600000, T, L+1) = 0.0310, FPIR=0.001000 vs. lowest 0.0039 from sensetime_006

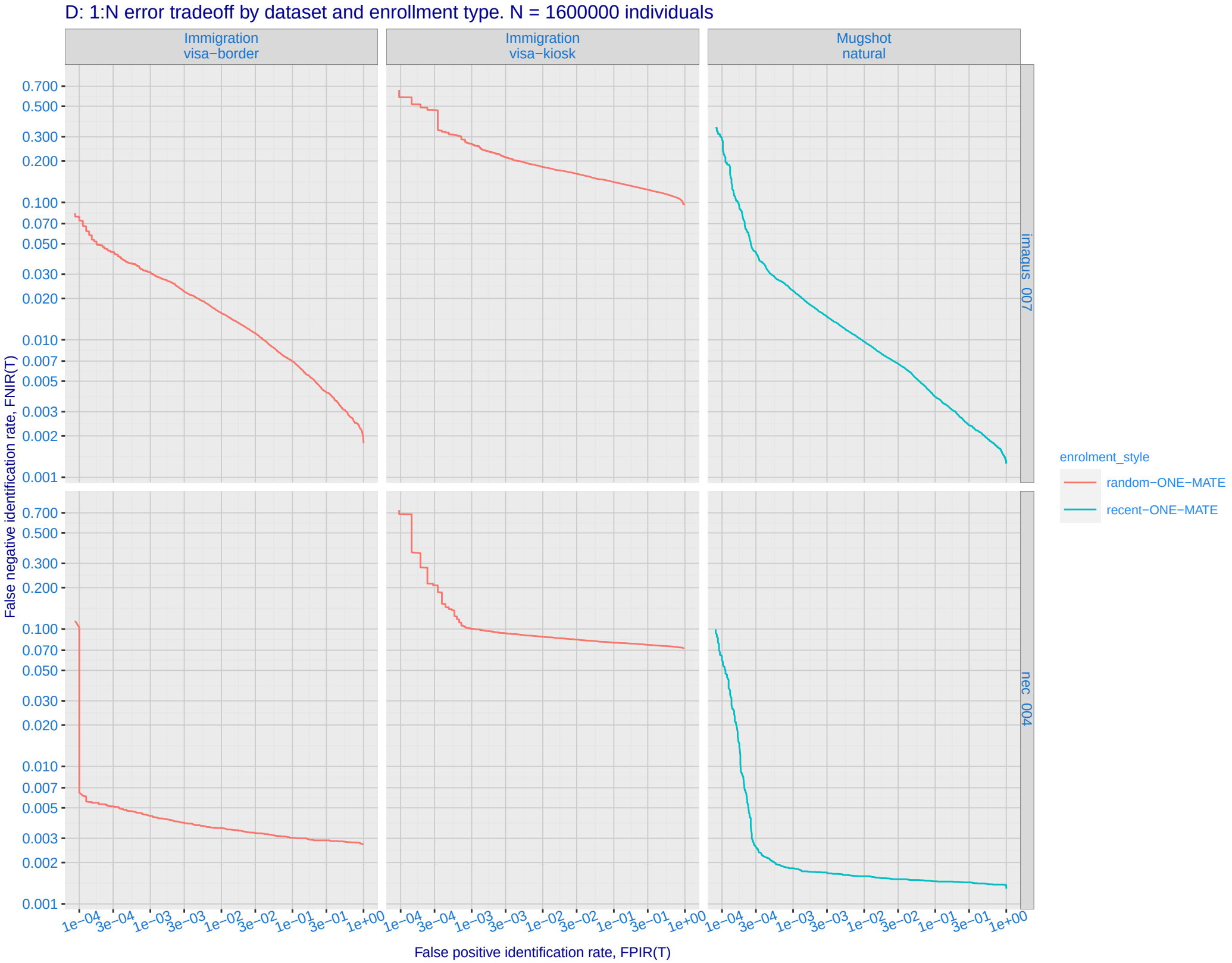
Immigration visa−kiosk ranking 63 (out of 205) −− FNIR(1600000, T, L+1) = 0.2675, FPIR=0.001000 vs. lowest 0.0729 from cubox_000

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (nec_004)

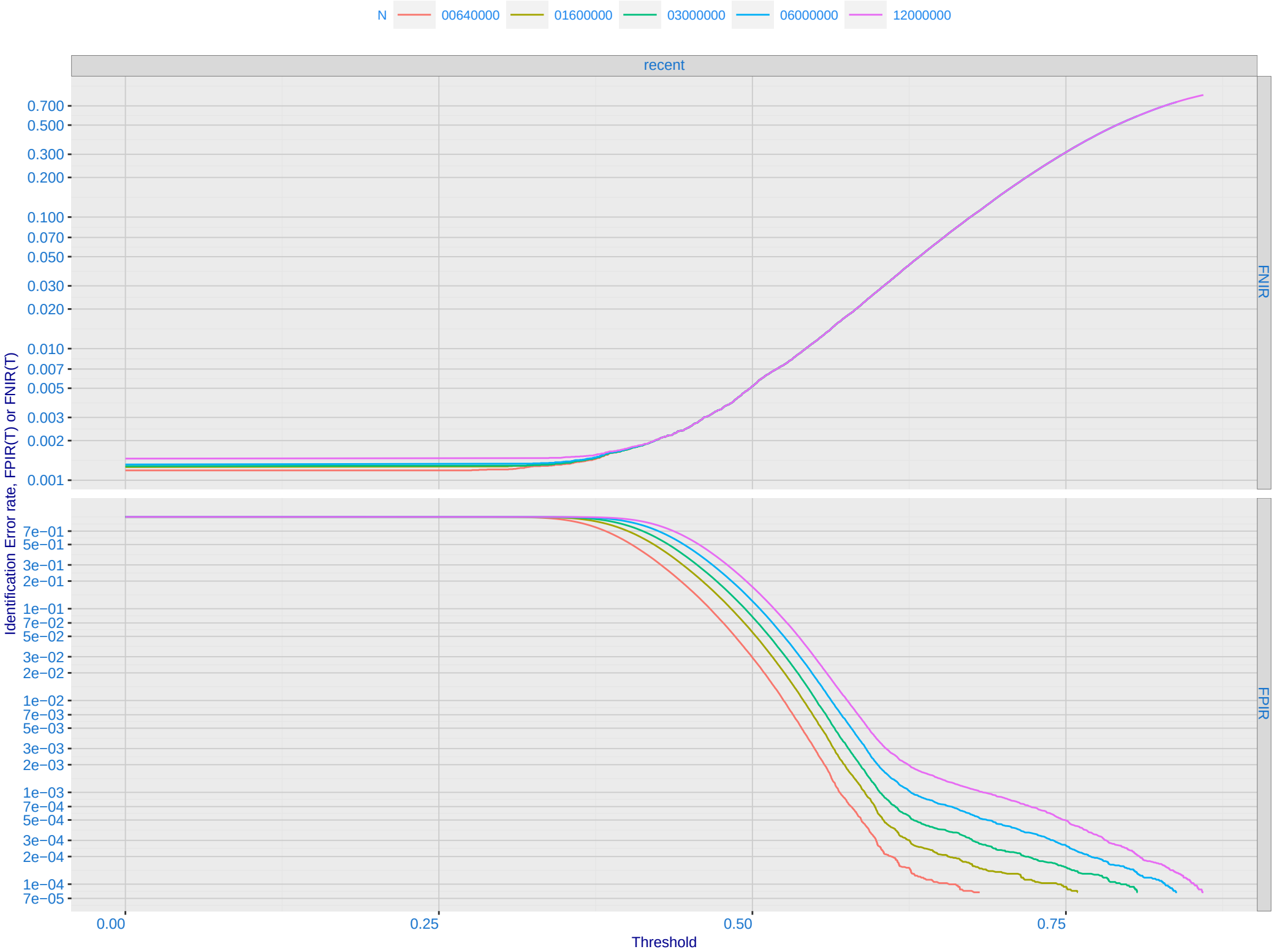


C: Evolution of accuracy for IMAGUS algorithms on three datasets 2018 − present

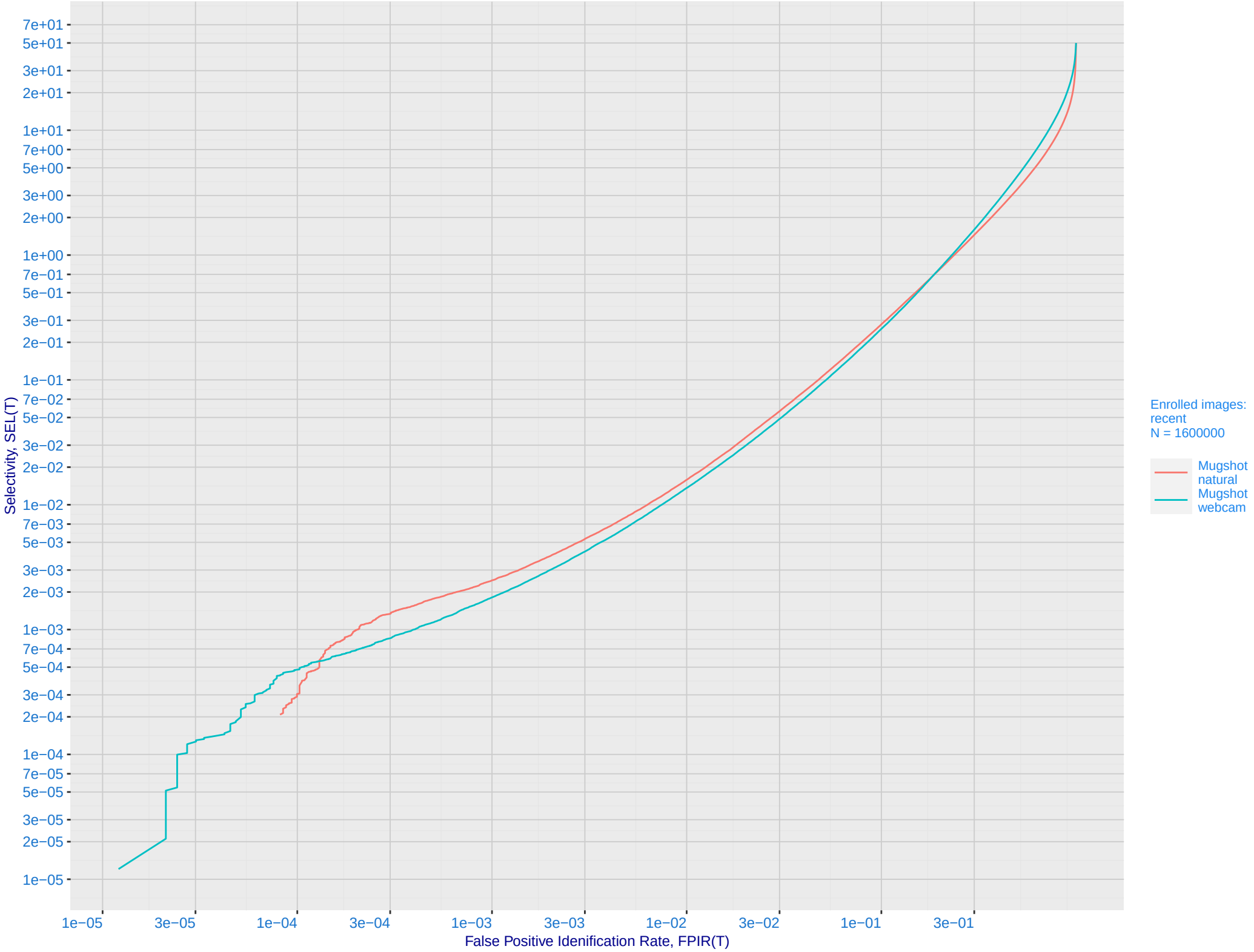


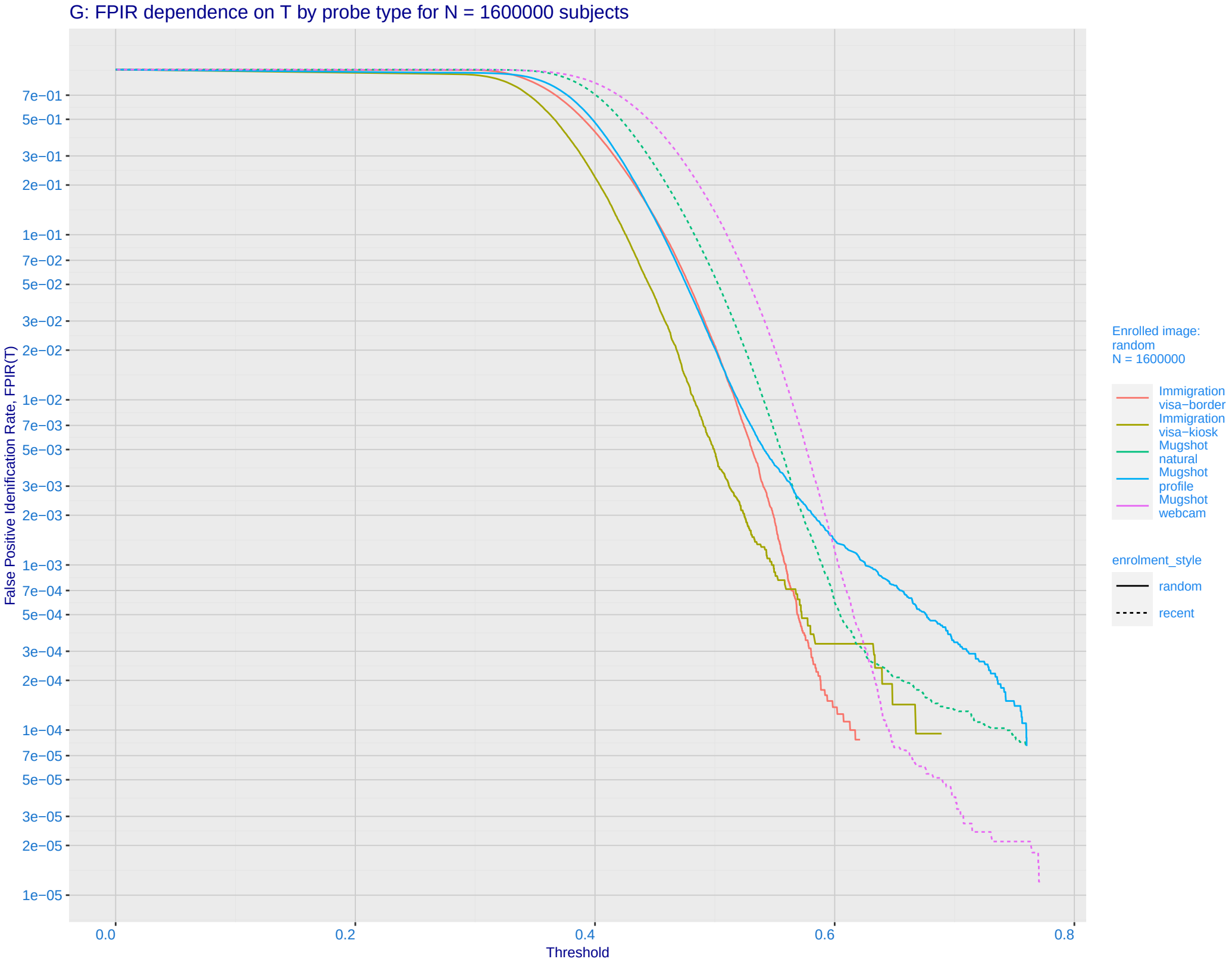

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
imagus_007
nec_004
False negative identification rate, FNIR(T)
False positive identification rate, FPIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
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

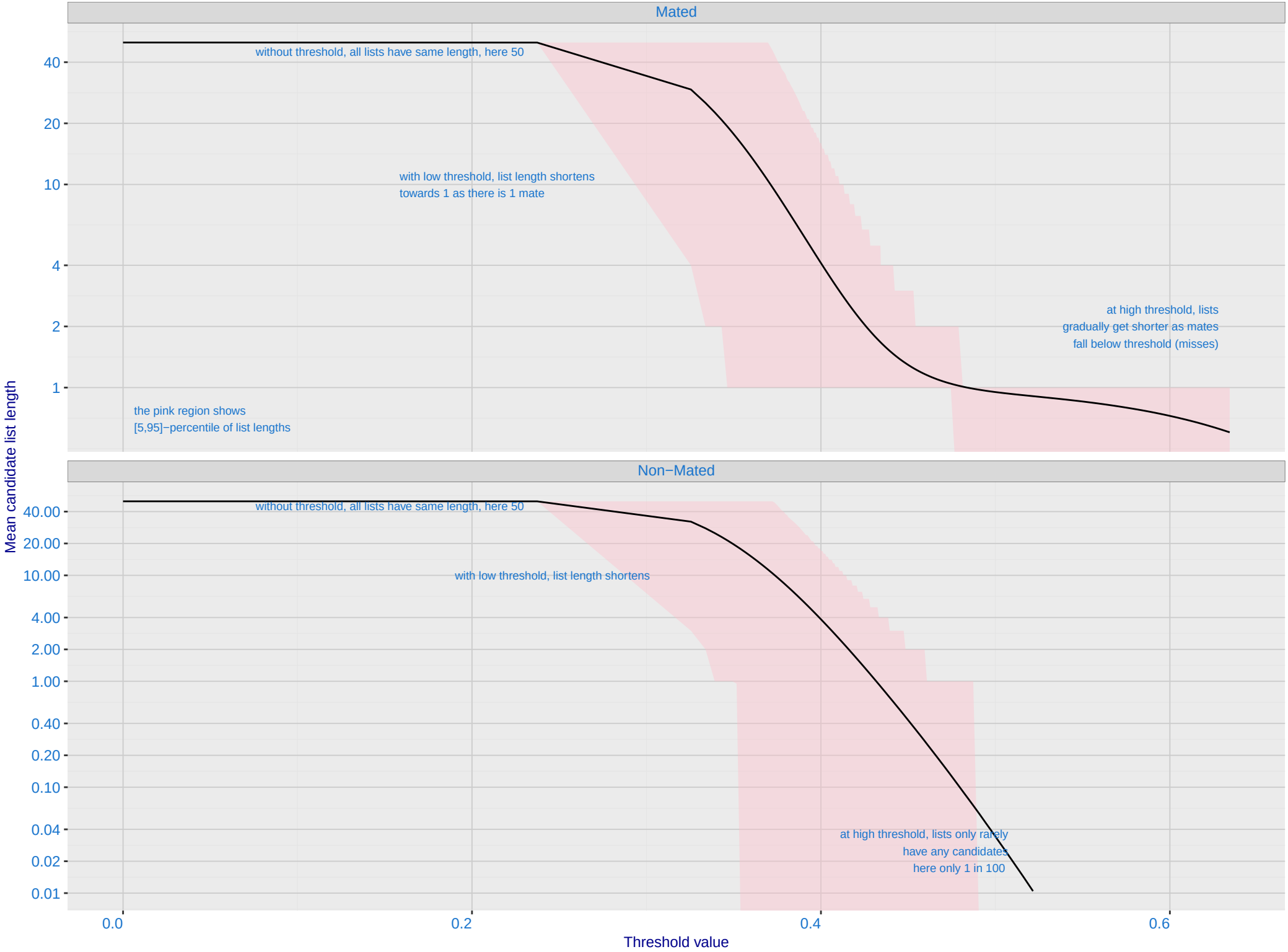


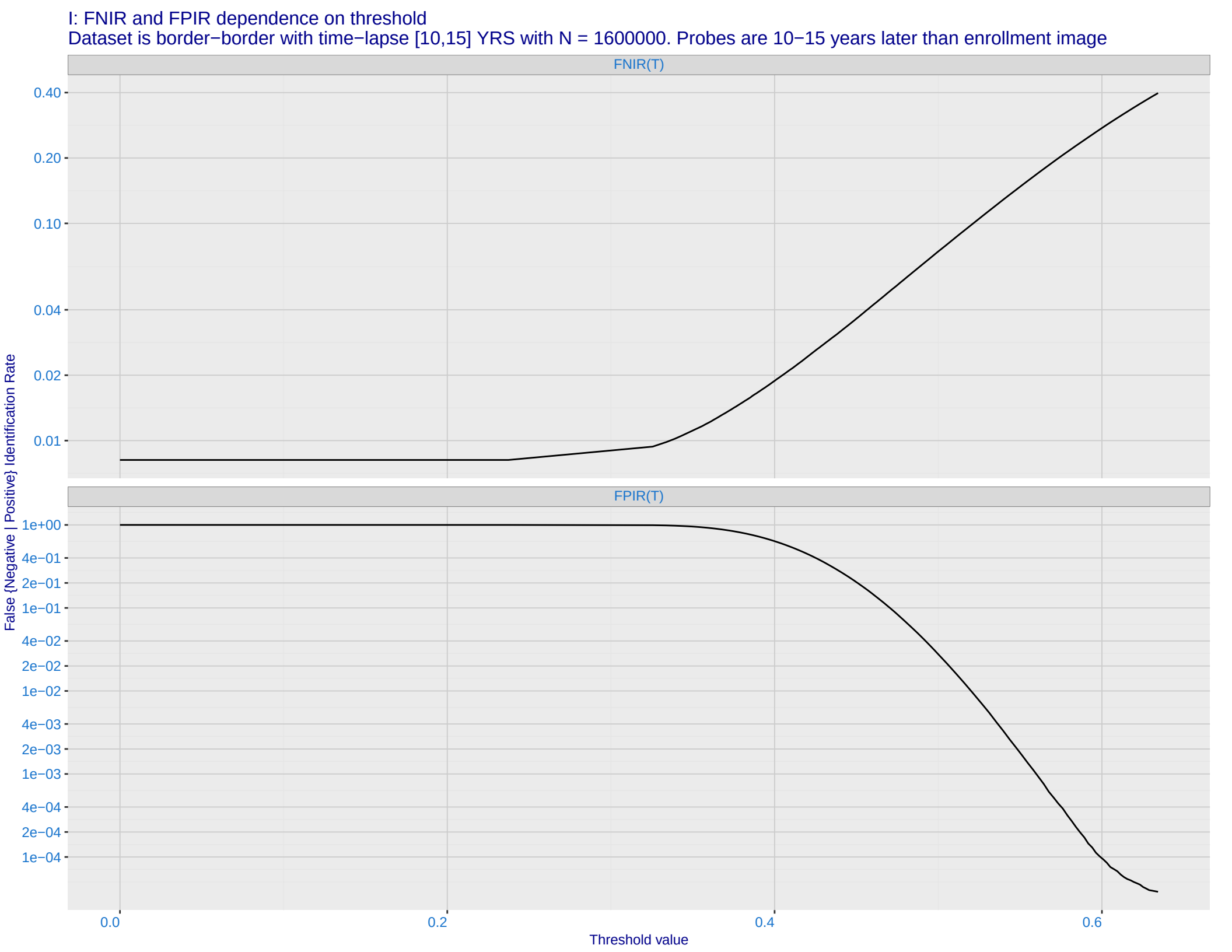
F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate



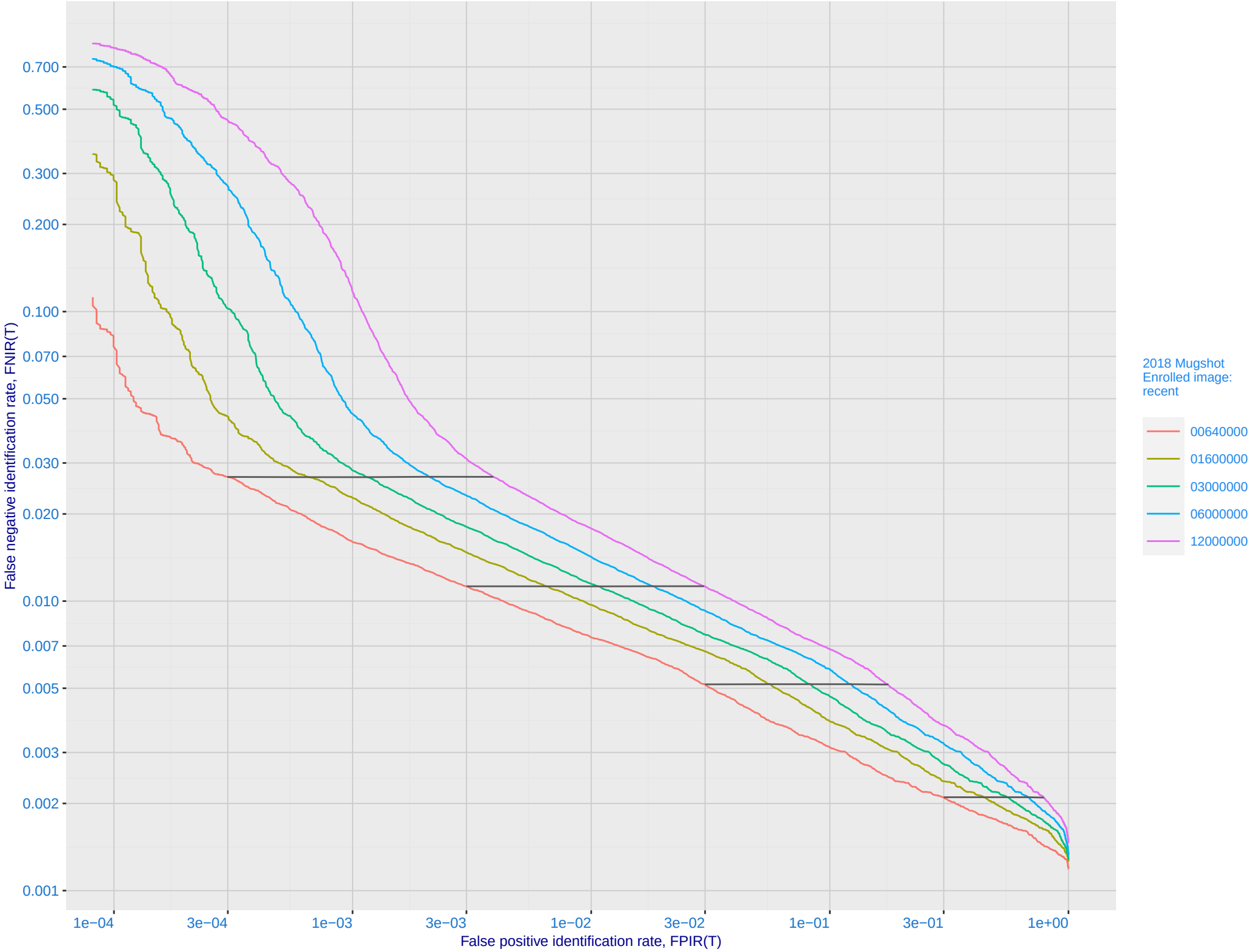

G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Idenification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
0.0
0.2
0.4
0.6
0.8
Threshold
Enrolled image:
random
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot profile
Mugshot webcam
enrolment_style
random
recent

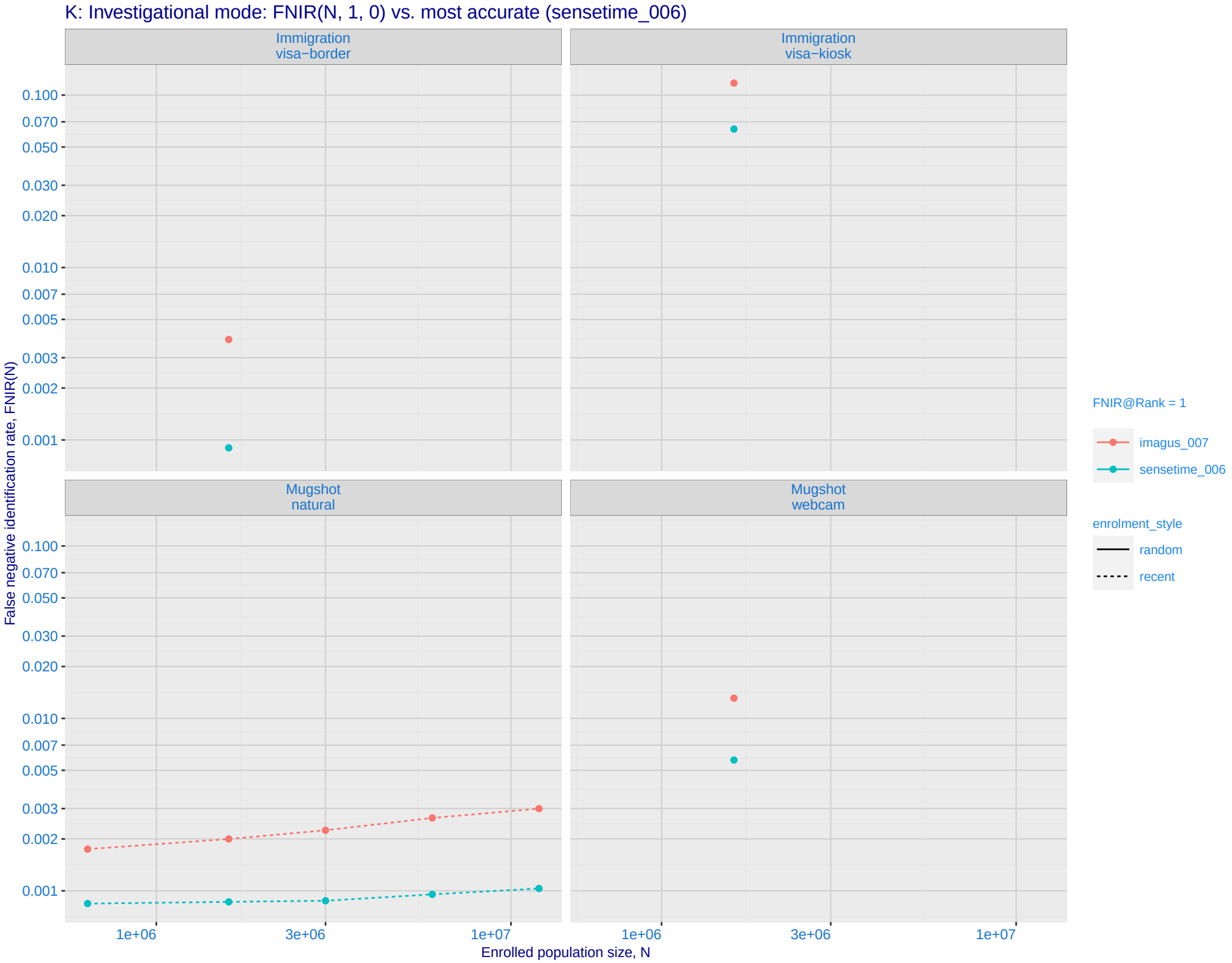
H: Reduced length candidate lists for human review
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image

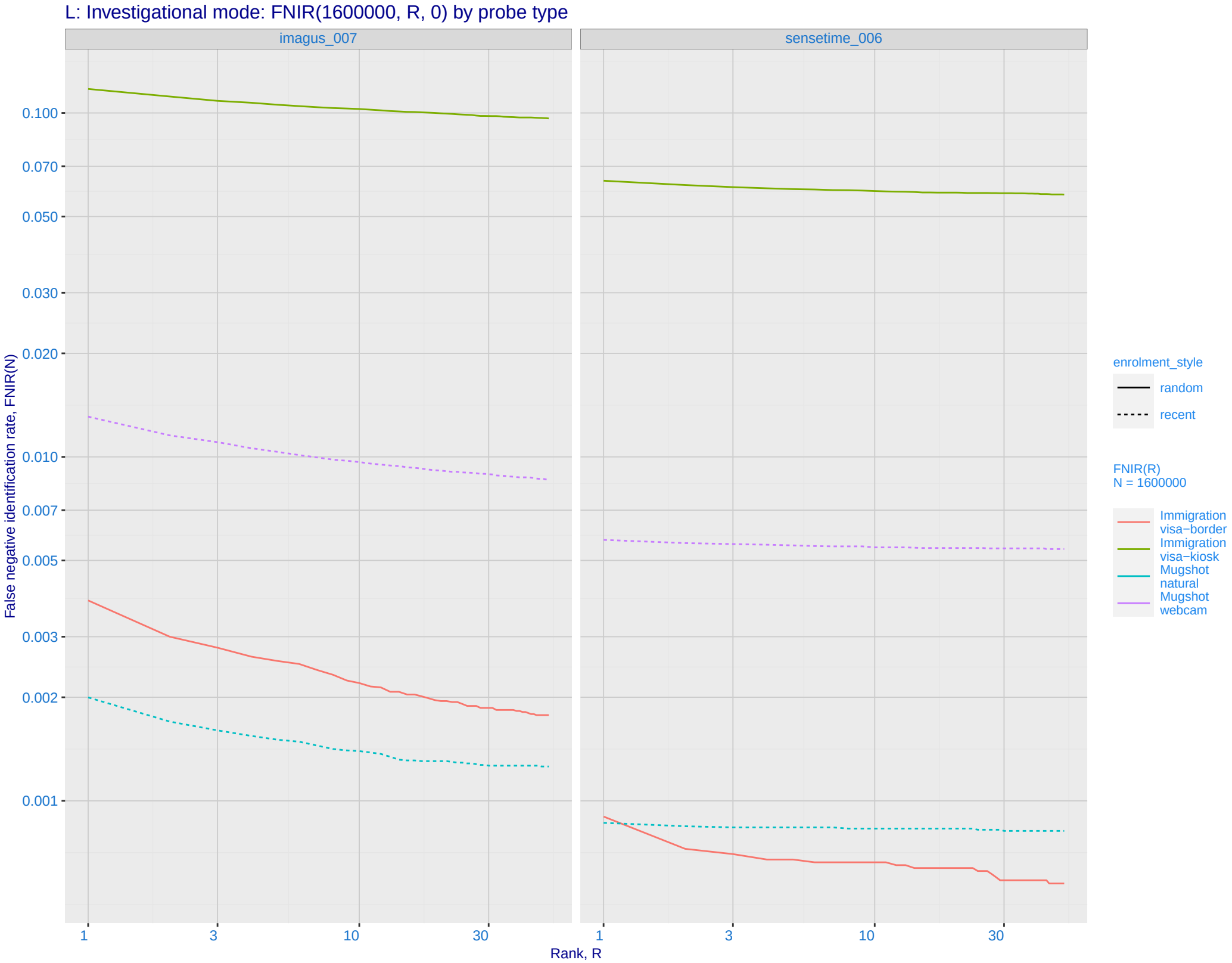



I: FNIR and FPIR dependence on threshold
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
FNIR(T)
FPIR(T)
False {Negative | Positive} Identification Rate
Threshold value
0.40
0.20
0.10
0.04
0.02
0.01
1e+00
4e−01
2e−01
1e−01
4e−02
2e−02
1e−02
4e−03
2e−03
1e−03
4e−04
2e−04
1e−04
0.0
0.2
0.4
0.6

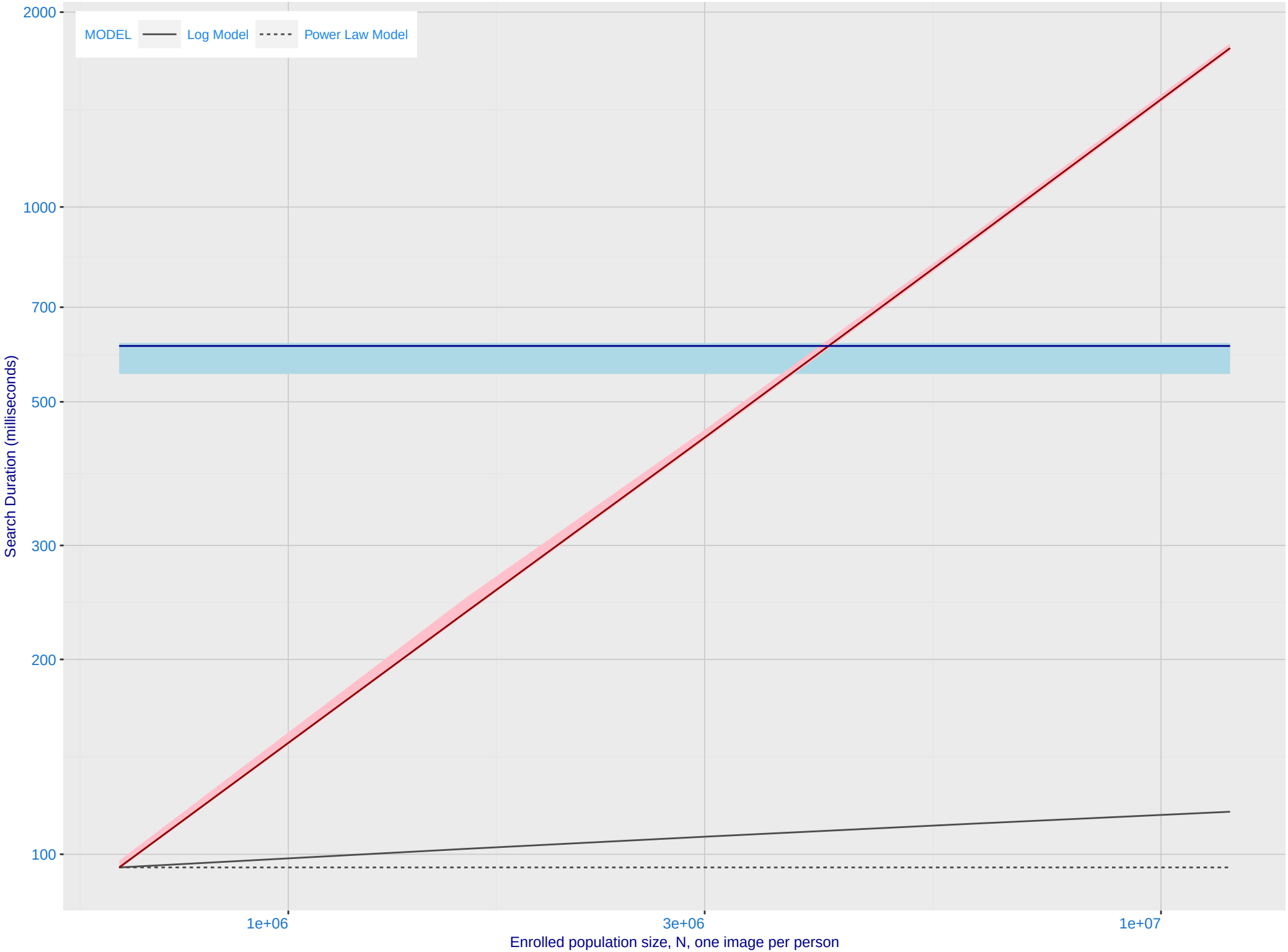
J: DET for Mugshot natural images and various N. Links connect points of equal threshold.




K: Investigational mode: FNIR(N, 1, 0) vs. most accurate (sensetime_006)
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
imagus_007
sensetime_006
enrolment_style
random
recent


L: Investigational mode: FNIR(1600000, R, 0) by probe type
imagus_007
sensetime_006
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.

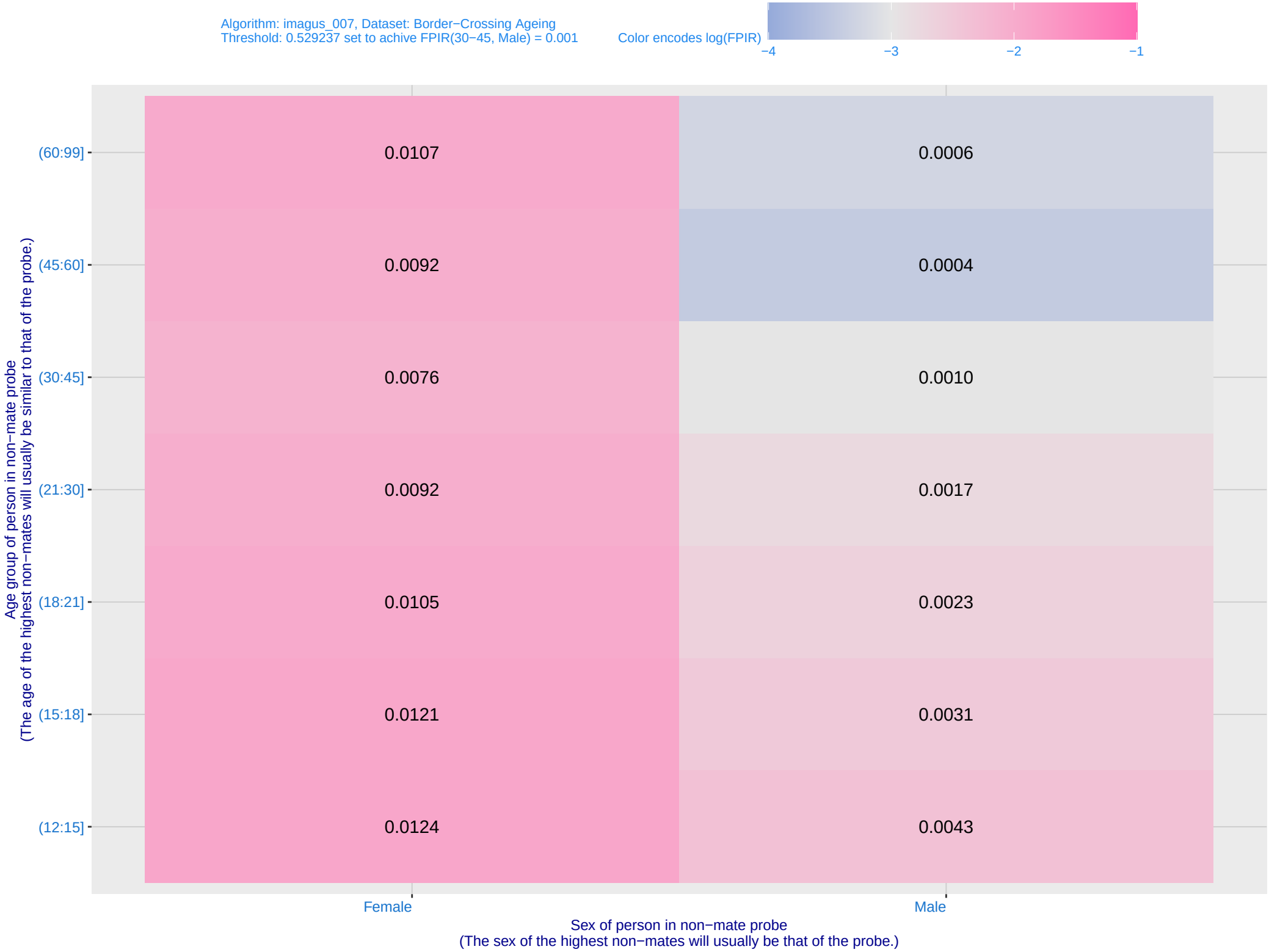
Algorithm: imagus_007, Dataset: Border−Crossing Ageing N = 1600000
Text encodes FNIR, Color encodes log(FNIR)

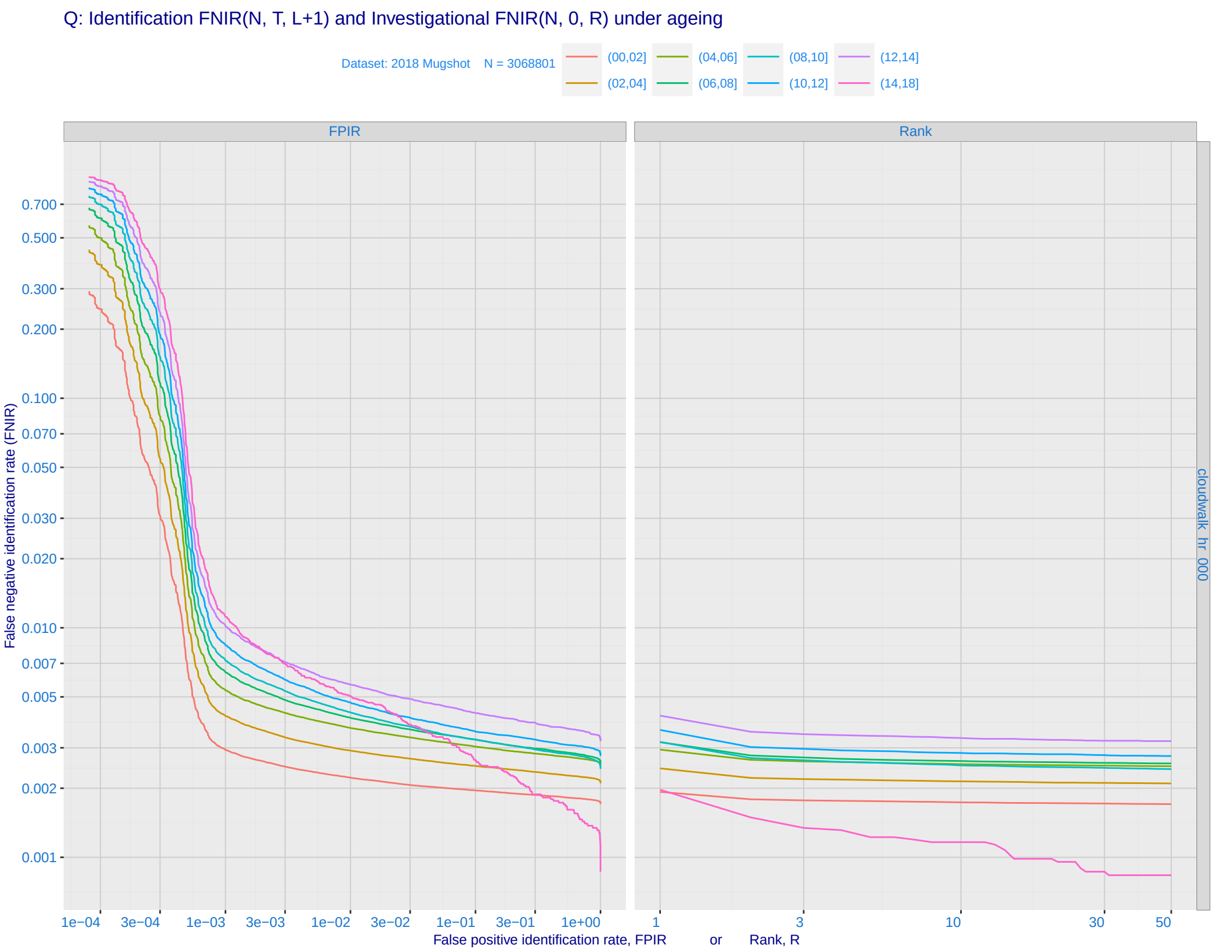
−3 −2 −1

Age group at time of enrollment	Female						Male					
	10	11	12	13	14	15	10	11	12	13	14	15
FNIR(R=1, T=0)												
(60:99]	0.020	0.024	0.030	0.028	0.033	0.029	0.010	0.010	0.009	0.011	0.011	0.013
(45:60]	0.019	0.018	0.021	0.023	0.026	0.025	0.009	0.008	0.009	0.011	0.010	0.012
(30:45]	0.018	0.019	0.022	0.025	0.027	0.027	0.009	0.008	0.009	0.010	0.011	0.009
(21:30]	0.028	0.027	0.029	0.033	0.036	0.036	0.011	0.011	0.012	0.013	0.015	0.012
(18:21]	0.047	0.044	0.046	0.056	0.054	0.067	0.021	0.025	0.025	0.028	0.030	0.035
(15:18]	0.066	0.063	0.064	0.068	0.072	0.064	0.056	0.052	0.051	0.069	0.071	0.073
(12:15]	0.089	0.077	0.088	0.095	0.097	0.077	0.106	0.085	0.119	0.112	0.113	0.109
FNIR(R=50, T=0.529237), FPIR(30−45, Male) = 0.001												
(60:99]	0.088	0.091	0.114	0.121	0.136	0.167	0.061	0.062	0.065	0.082	0.078	0.088
(45:60]	0.073	0.075	0.089	0.104	0.113	0.121	0.046	0.050	0.058	0.066	0.070	0.071
(30:45]	0.088	0.093	0.106	0.122	0.133	0.127	0.049	0.048	0.057	0.070	0.077	0.073
(21:30]	0.132	0.131	0.146	0.164	0.171	0.186	0.071	0.071	0.086	0.101	0.112	0.109
(18:21]	0.204	0.195	0.211	0.233	0.238	0.258	0.175	0.162	0.179	0.213	0.230	0.237
(15:18]	0.250	0.238	0.255	0.282	0.295	0.251	0.310	0.308	0.333	0.381	0.394	0.422
(12:15]	0.312	0.298	0.300	0.345	0.353	0.362	0.463	0.443	0.485	0.518	0.544	0.464

Time between probe and enrollment (years)

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