A: Datasheet

Algorithm: xforwardai_001

Developer: Xforward AI Technology

Submission Date: 2021_01_21

Template size: 2048 bytes

Template time (2.5 percentile): 676 msec

Template time (median): 677 msec

Template time (97.5 percentile): 696 msec

Investigation:

Frontal mugshot ranking 34 (out of 271) −− FNIR(1600000, 0, 1) = 0.0020 vs. lowest 0.0009 from sensetime_005

Mugshot webcam ranking 32 (out of 232) −− FNIR(1600000, 0, 1) = 0.0125 vs. lowest 0.0062 from sensetime_005

Mugshot profile ranking 4 (out of 201) −− FNIR(1600000, 0, 1) = 0.0667 vs. lowest 0.0591 from sensetime_005

Immigration visa−border ranking 16 (out of 160) −− FNIR(1600000, 0, 1) = 0.0028 vs. lowest 0.0013 from visionlabs_010

Immigration visa−kiosk ranking 12 (out of 157) −− FNIR(1600000, 0, 1) = 0.0819 vs. lowest 0.0568 from hr_000

Identification:

Frontal mugshot ranking 12 (out of 271) −− FNIR(1600000, T, L+1) = 0.0048, FPIR=0.001000 vs. lowest 0.0018 from sensetime_004

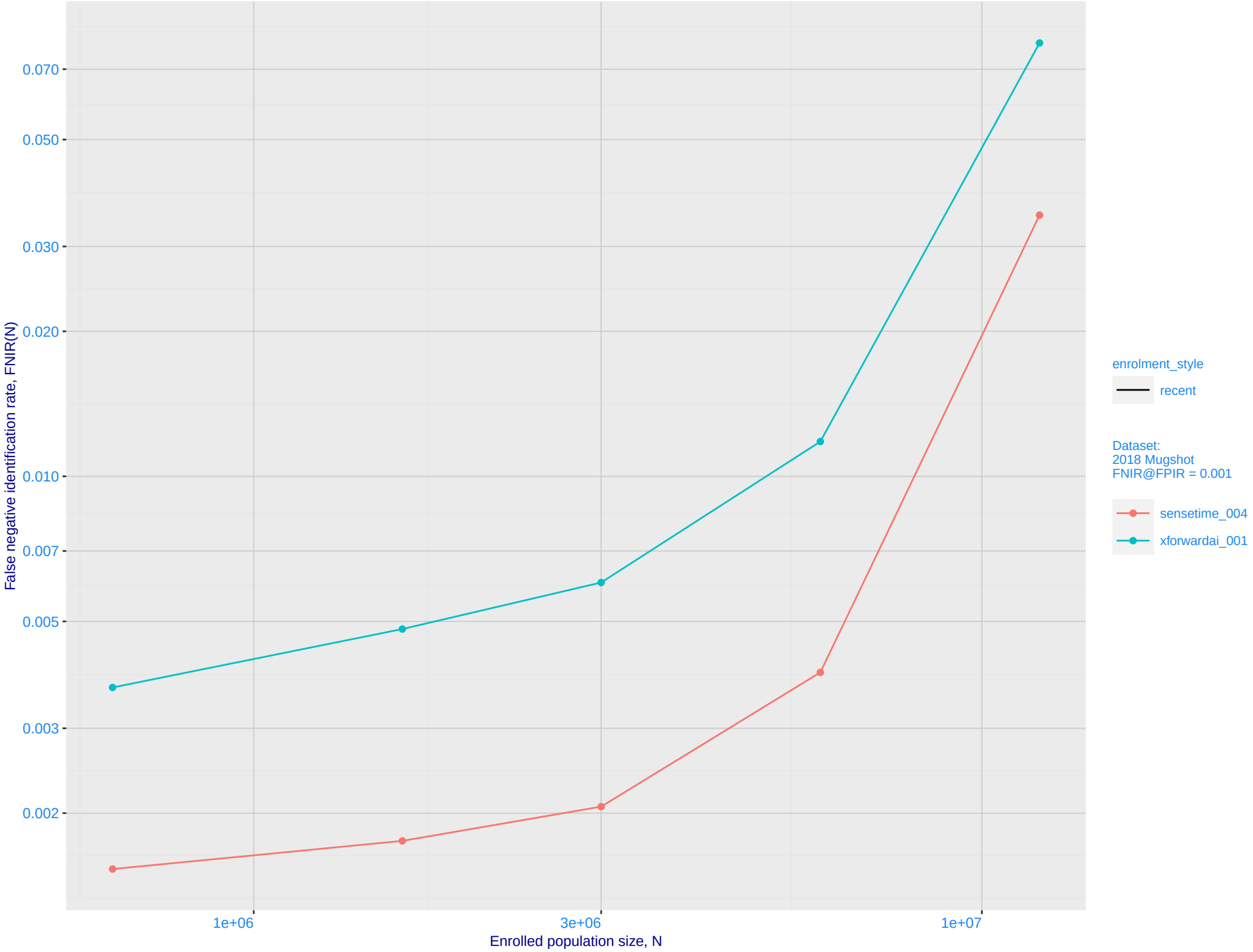
Mugshot webcam ranking 16 (out of 230) −− FNIR(1600000, T, L+1) = 0.0282, FPIR=0.001000 vs. lowest 0.0122 from sensetime_003

Mugshot profile ranking 8 (out of 200) −− FNIR(1600000, T, L+1) = 0.4479, FPIR=0.001000 vs. lowest 0.1331 from hr_000

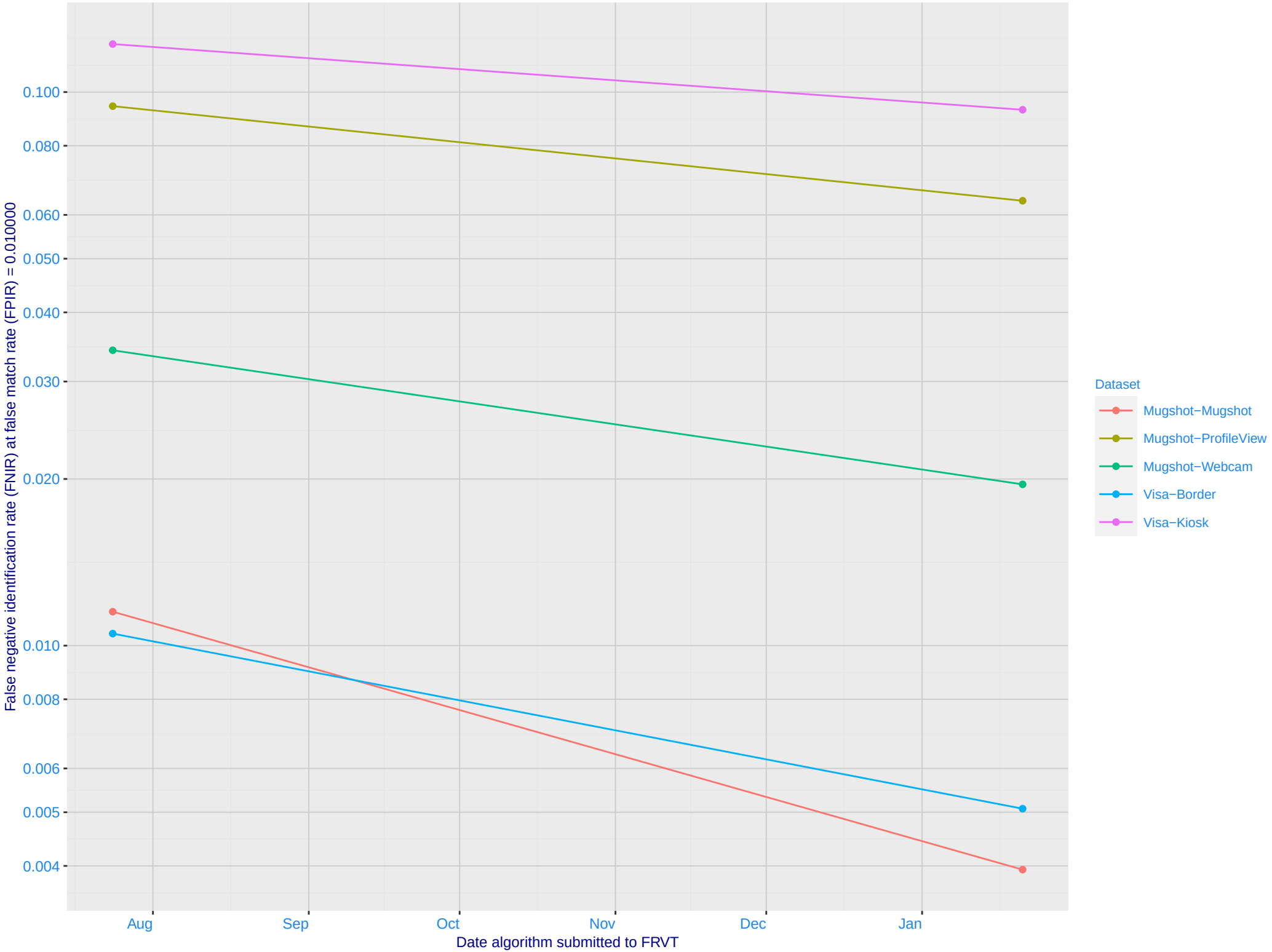
Immigration visa−border ranking 9 (out of 159) −− FNIR(1600000, T, L+1) = 0.0080, FPIR=0.001000 vs. lowest 0.0047 from idemia_008

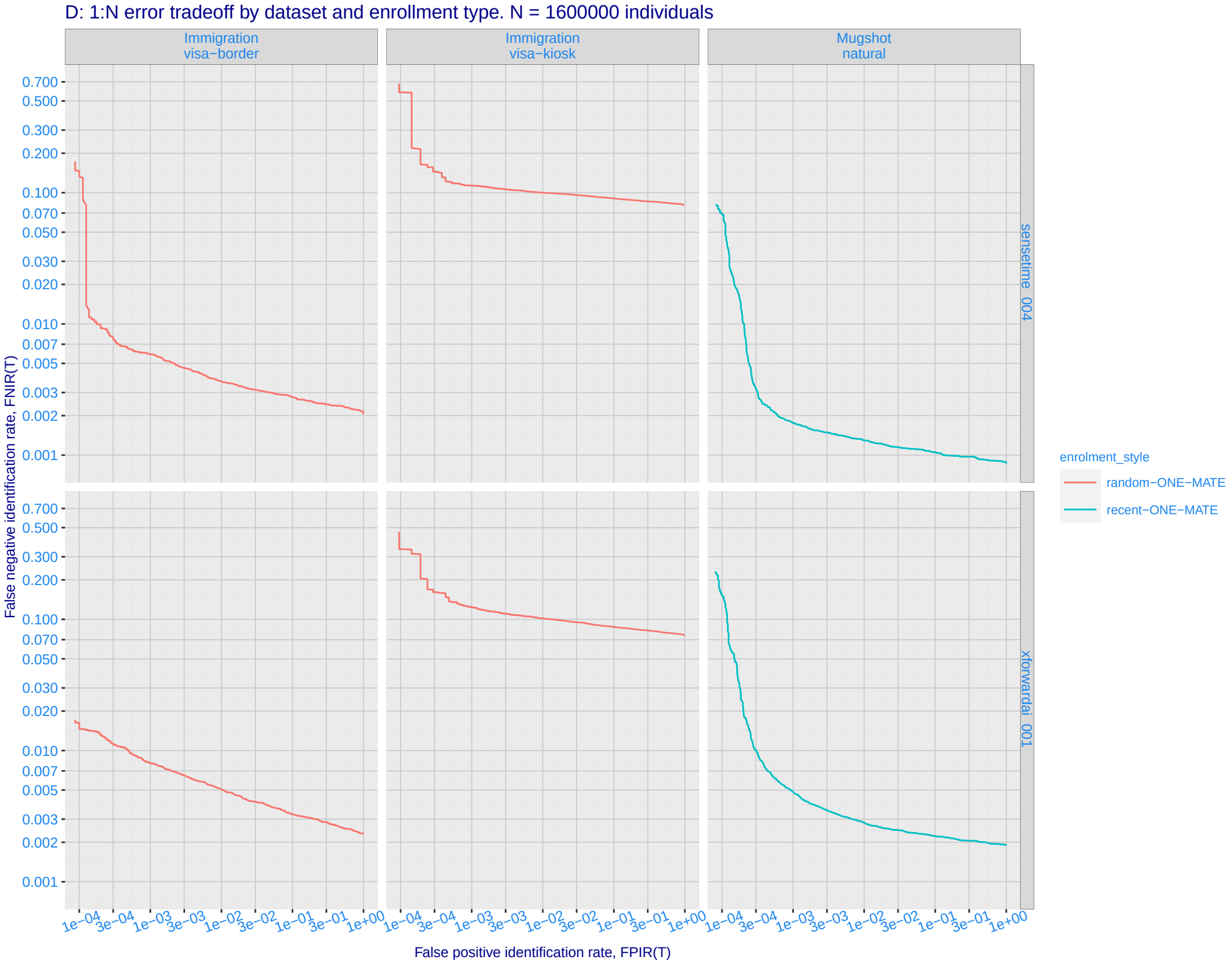
Immigration visa−kiosk ranking 7 (out of 154) −− FNIR(1600000, T, L+1) = 0.1241, FPIR=0.001000 vs. lowest 0.0996 from hr_000

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

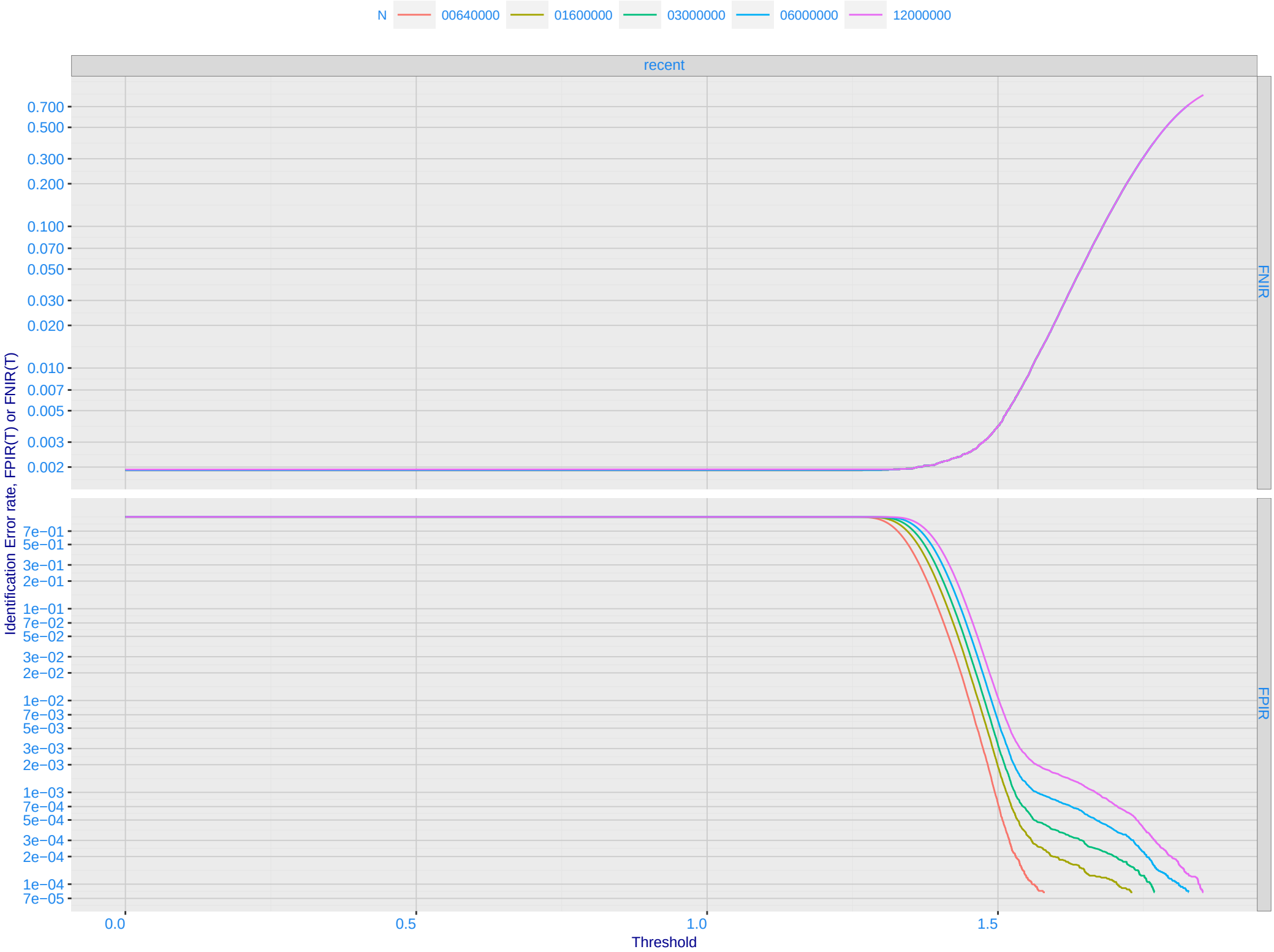


C: Evolution of accuracy for XFORWARDAI algorithms on three datasets 2018 − present

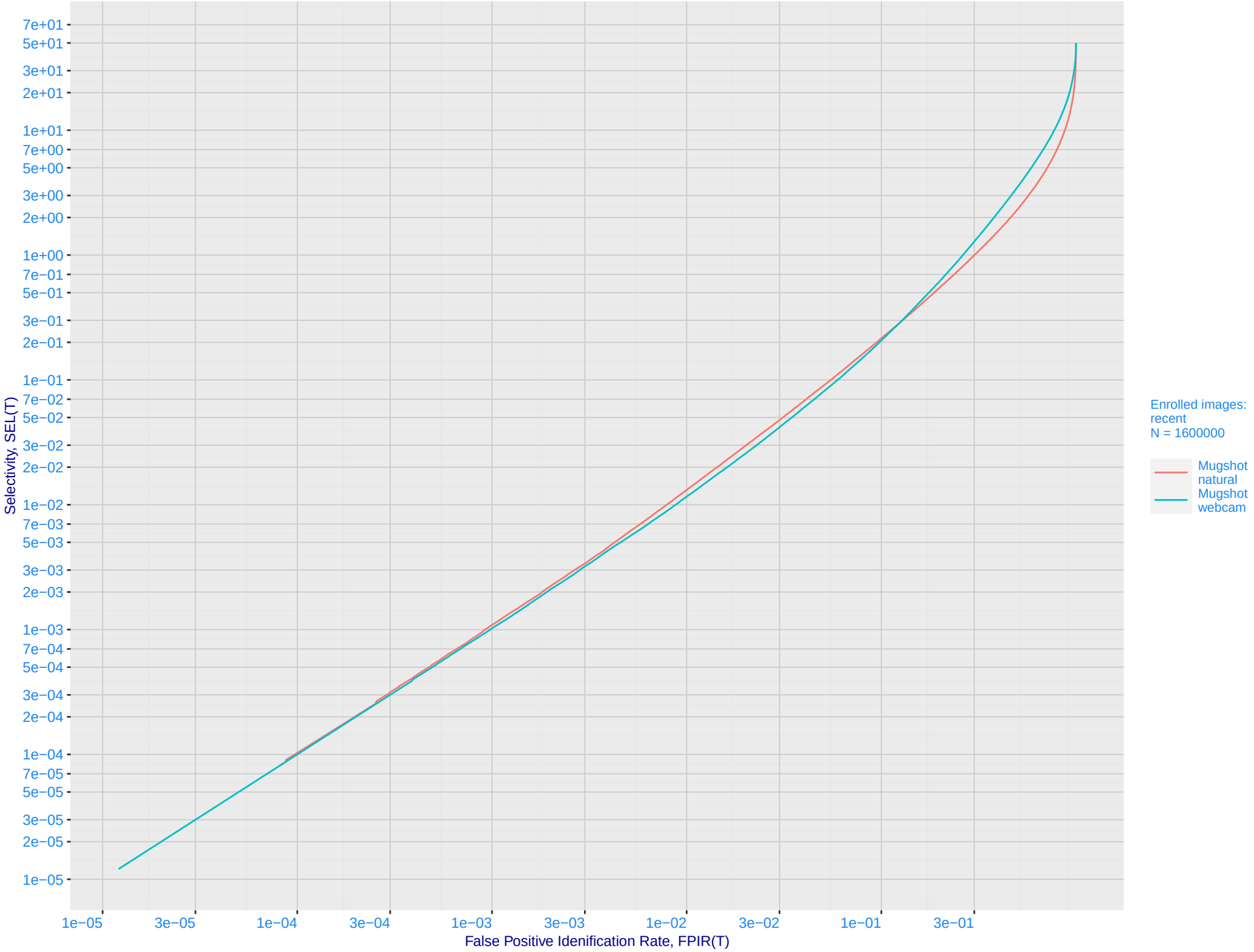


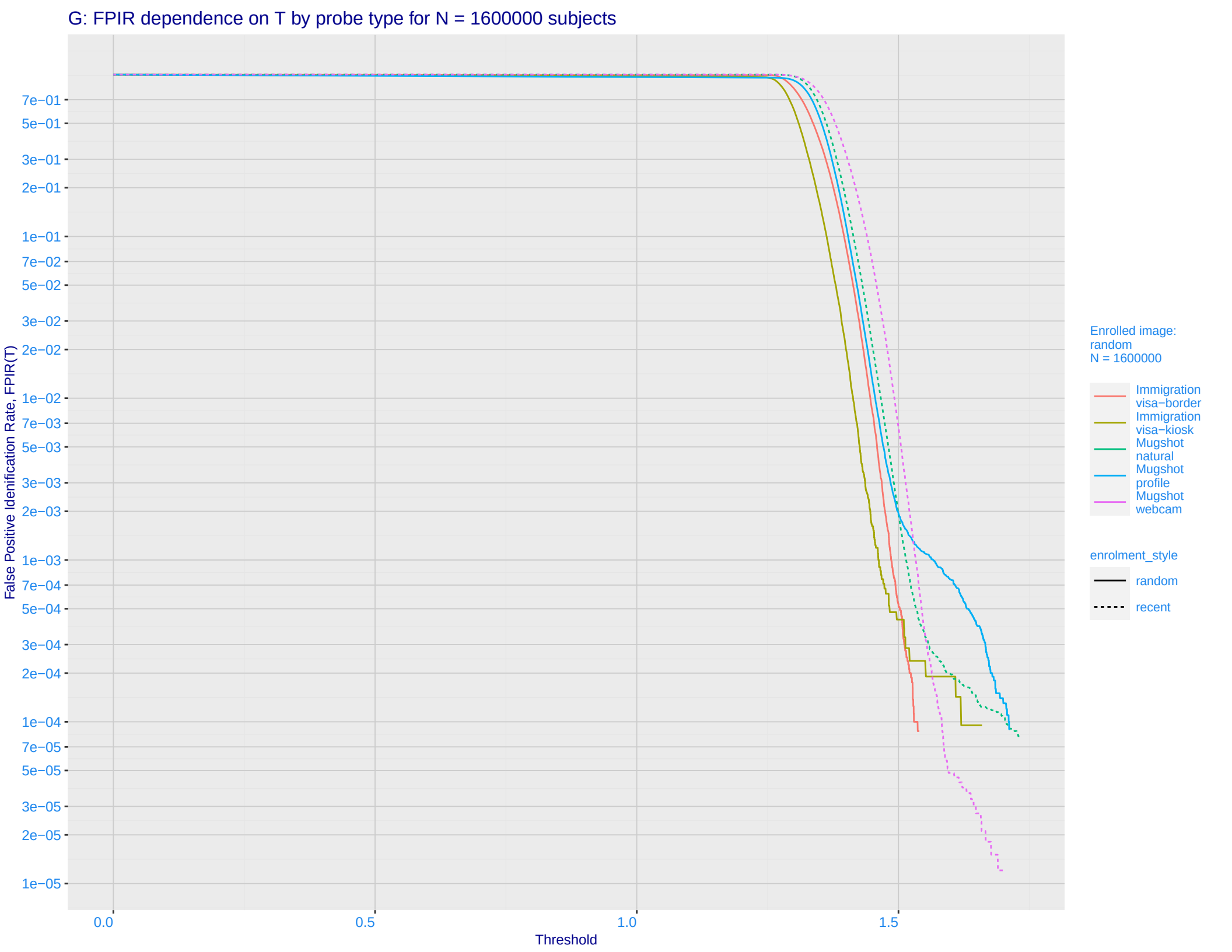

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
sensetime_004
xforwardai_001
False negative identification rate, FNIR(T)
False positive identification rate, FPIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
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

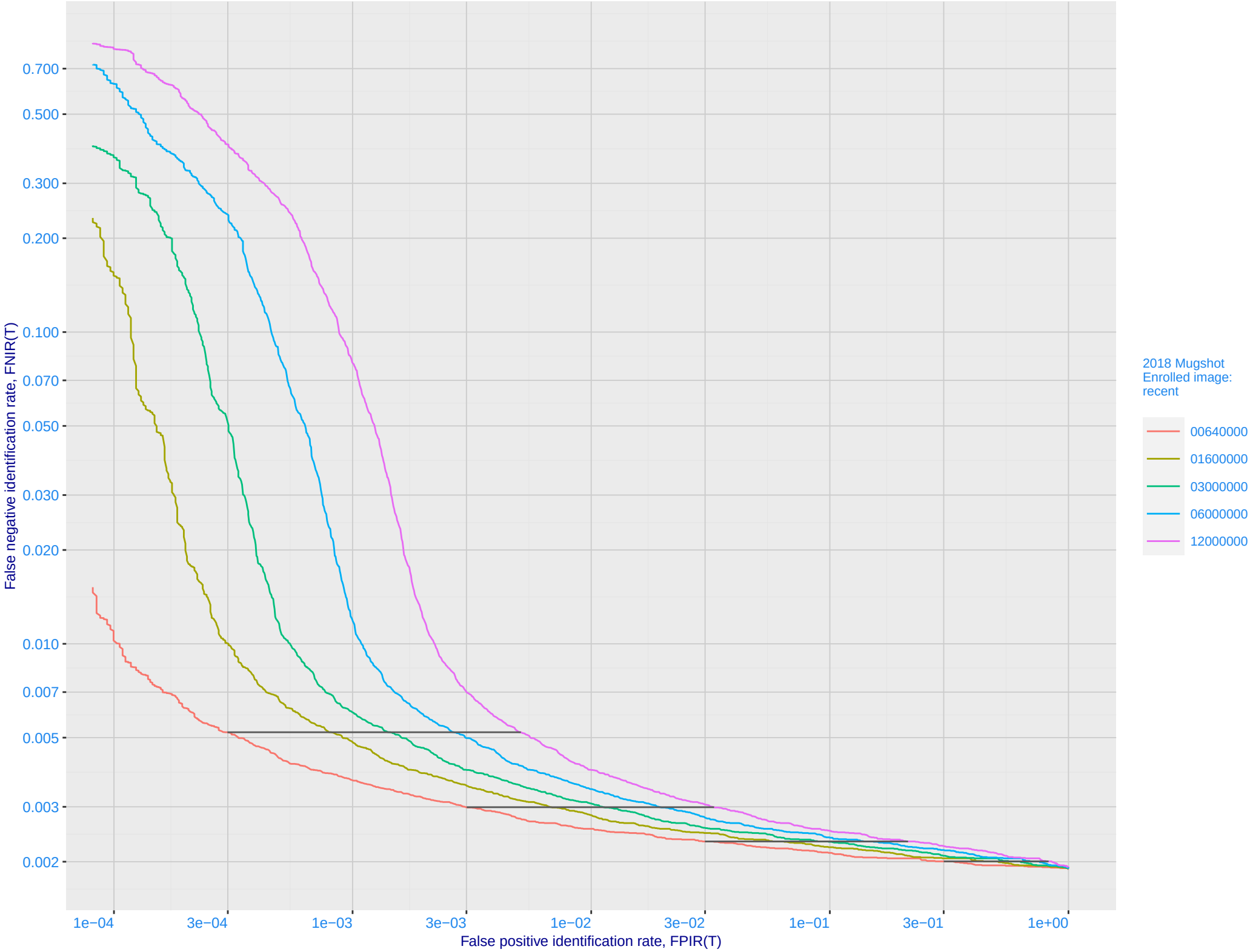


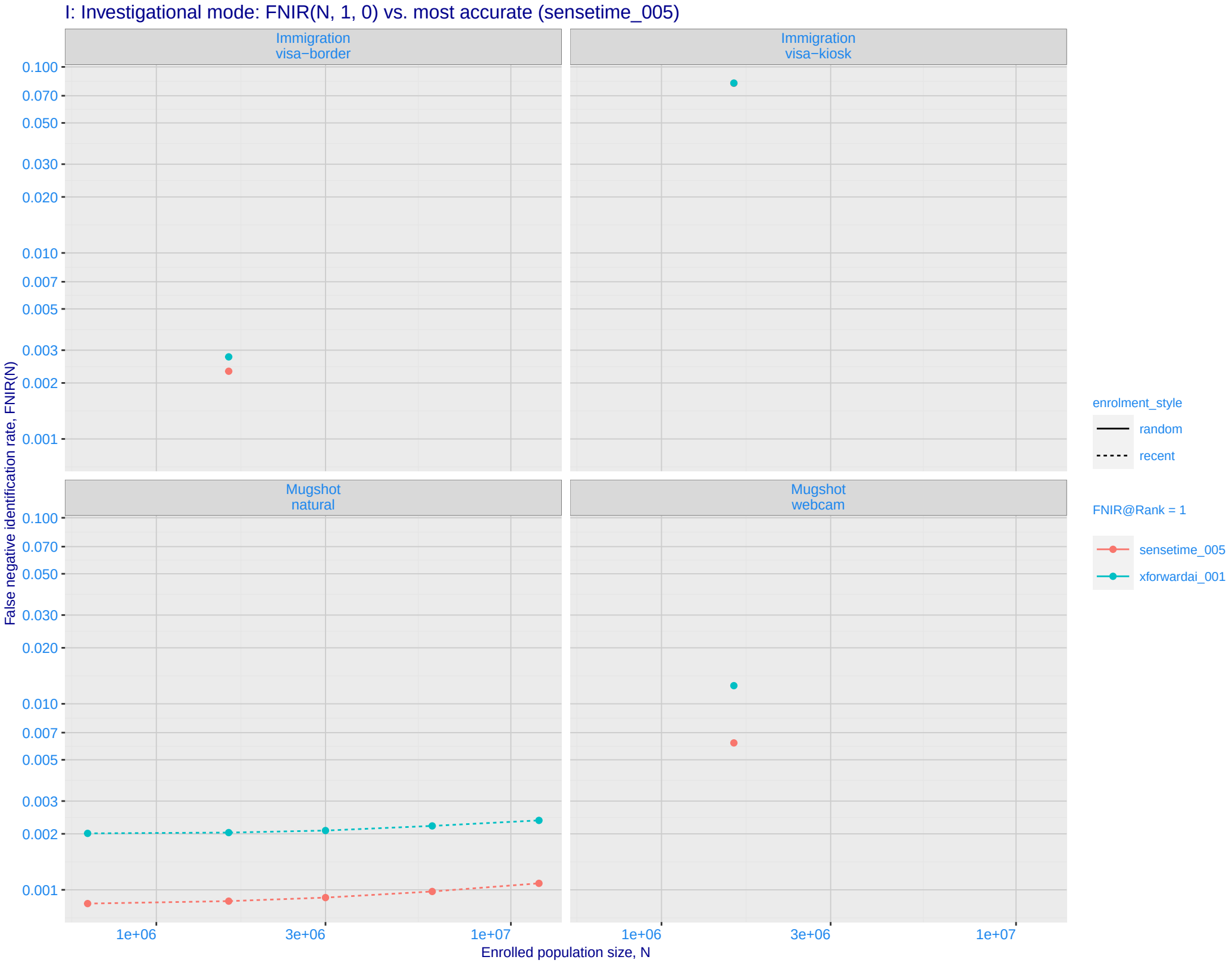
F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate

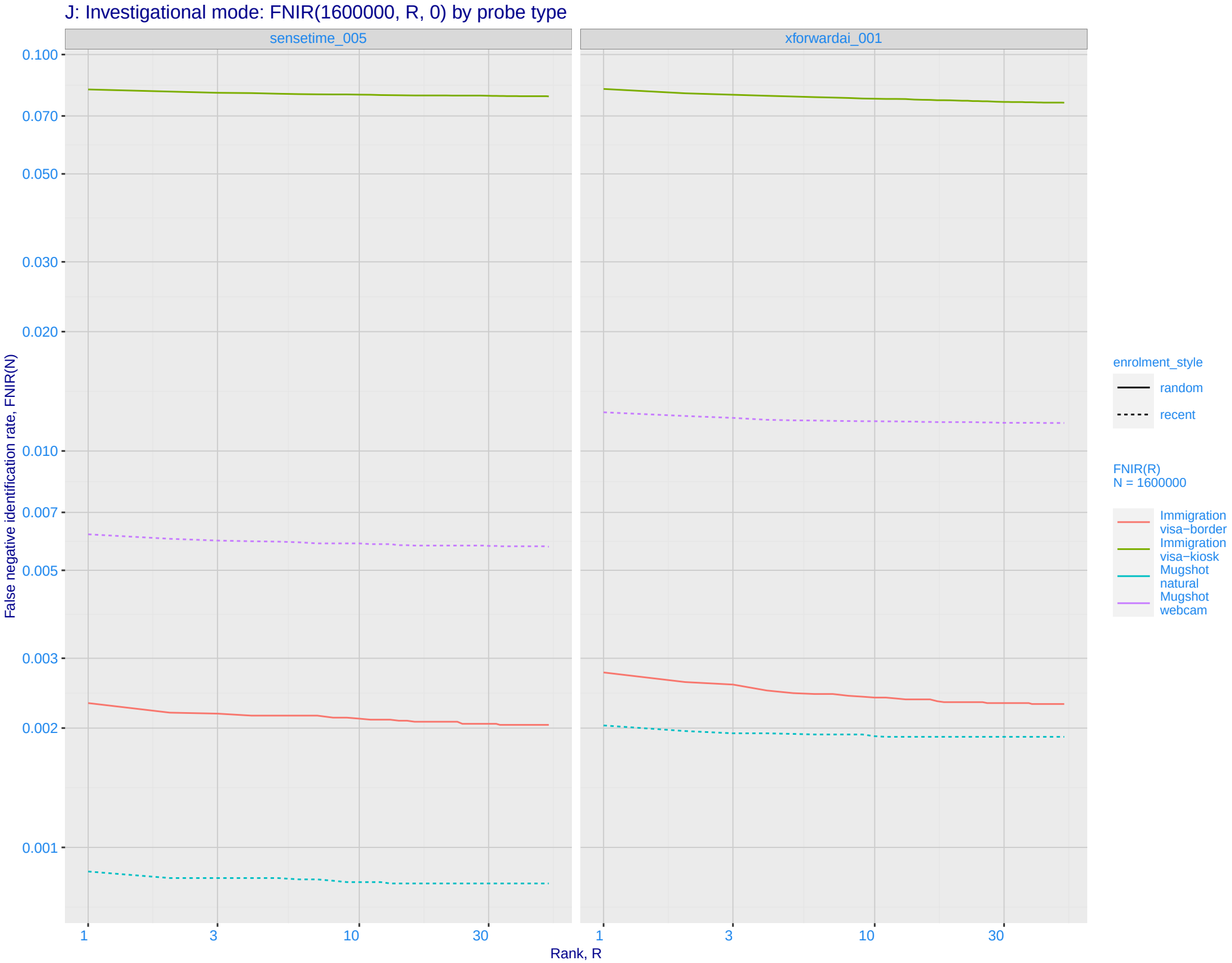



G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Idenification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
0.0
0.5
1.0
1.5
Threshold
Enrolled image:
random
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot profile
Mugshot webcam
enrolment_style
random
recent

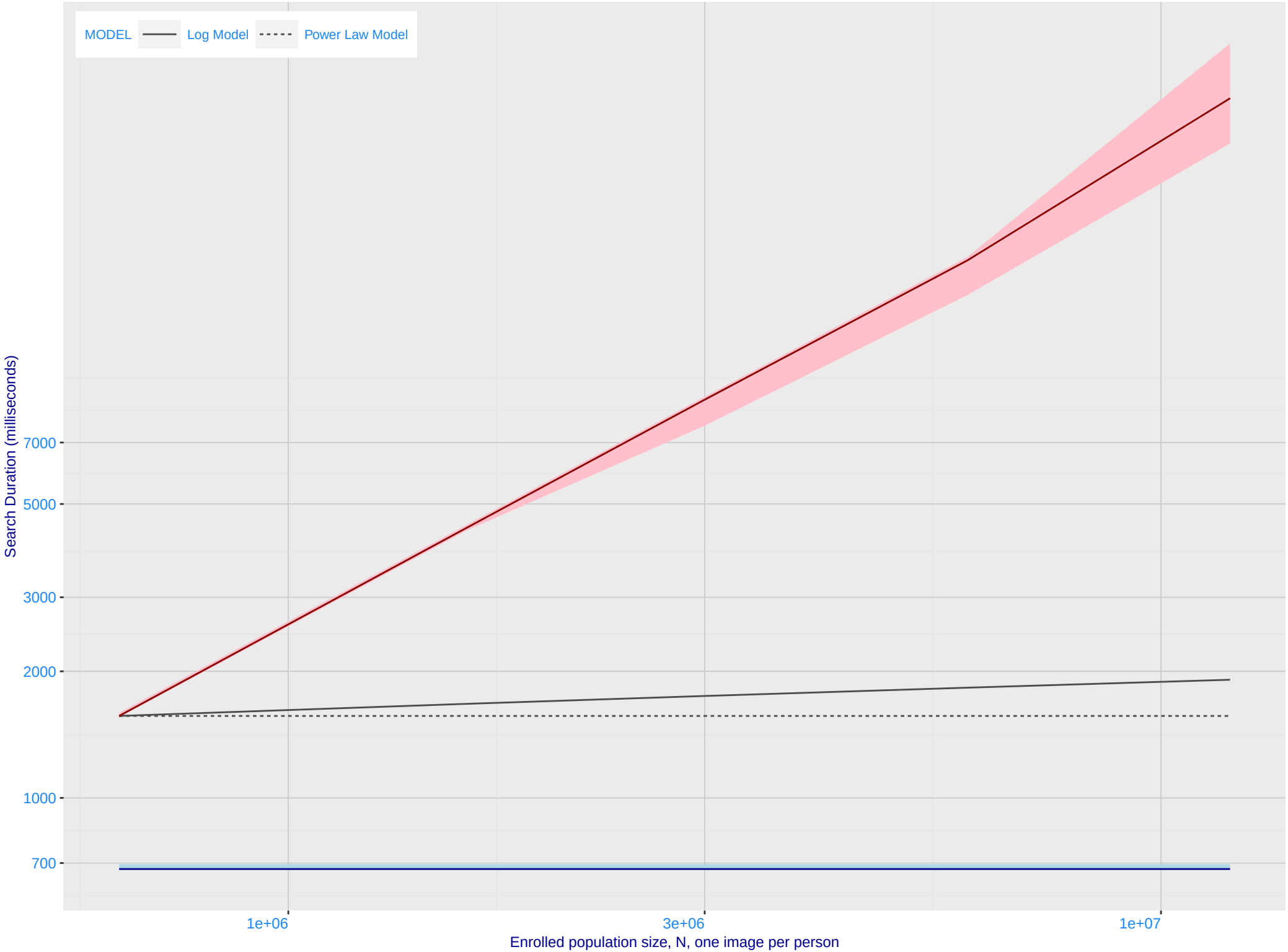
H: DET for Mugshot natural images and various N. Links connect points of equal threshold.




I: 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
enrolment_style
random
recent
FNIR@Rank = 1
sensetime_005
xforwardai_001


J: Investigational mode: FNIR(1600000, R, 0) by probe type
sensetime_005
xforwardai_001
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

K: 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



M−A: FNIR(T, N = 1.6 million) by sex, age and time−lapse

Algorithm: xforwardai_001, Dataset: Border−Crossing Ageing
Threshold: 1.466430 set to achieve FPIR(30−45, Male) = 0.001

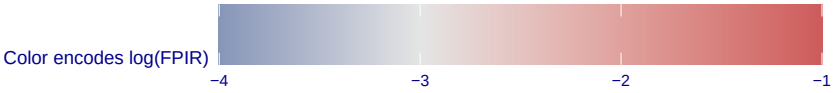
Color encodes log(FNIR)

Age group at time of enrollment	Female						Male					
	10	11	12	13	14	15	10	11	12	13	14	15
(60:99]	0.028	0.030	0.037	0.038	0.045	0.049	0.015	0.014	0.014	0.017	0.016	0.020
(45:60]	0.025	0.025	0.029	0.033	0.038	0.039	0.010	0.010	0.012	0.015	0.014	0.016
(30:45]	0.028	0.030	0.035	0.040	0.042	0.044	0.012	0.010	0.013	0.015	0.017	0.017
(21:30]	0.038	0.038	0.043	0.050	0.051	0.054	0.017	0.017	0.020	0.023	0.027	0.022
(18:21]	0.067	0.064	0.075	0.082	0.082	0.076	0.051	0.048	0.057	0.062	0.071	0.063
(15:18]	0.099	0.091	0.102	0.114	0.118	0.094	0.131	0.130	0.142	0.173	0.175	0.183
(12:15]	0.131	0.120	0.125	0.148	0.164	0.131	0.225	0.199	0.242	0.267	0.278	0.246

Time between probe and enrollment (years)

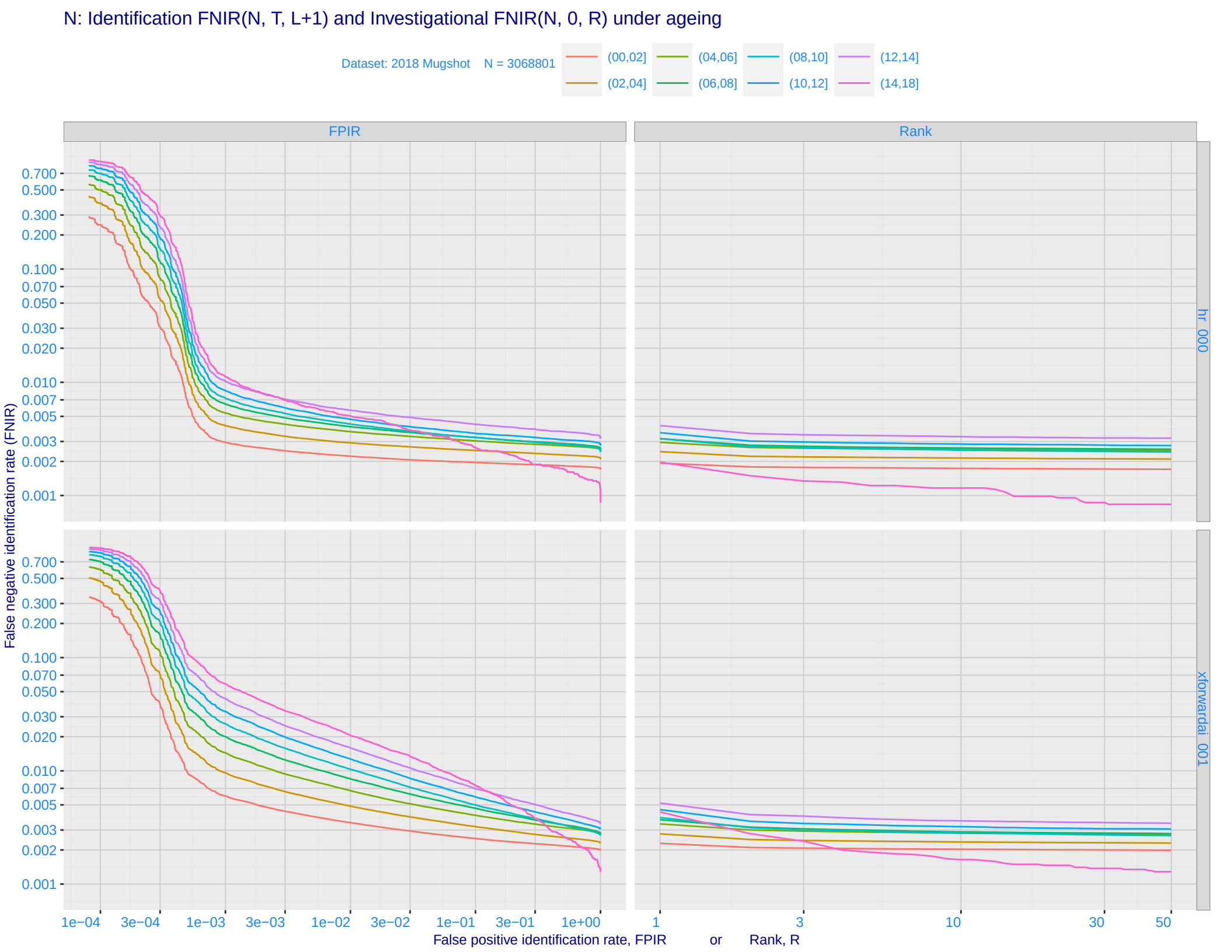
M−B: FPIR(T, N = 1.6 million) by sex and age

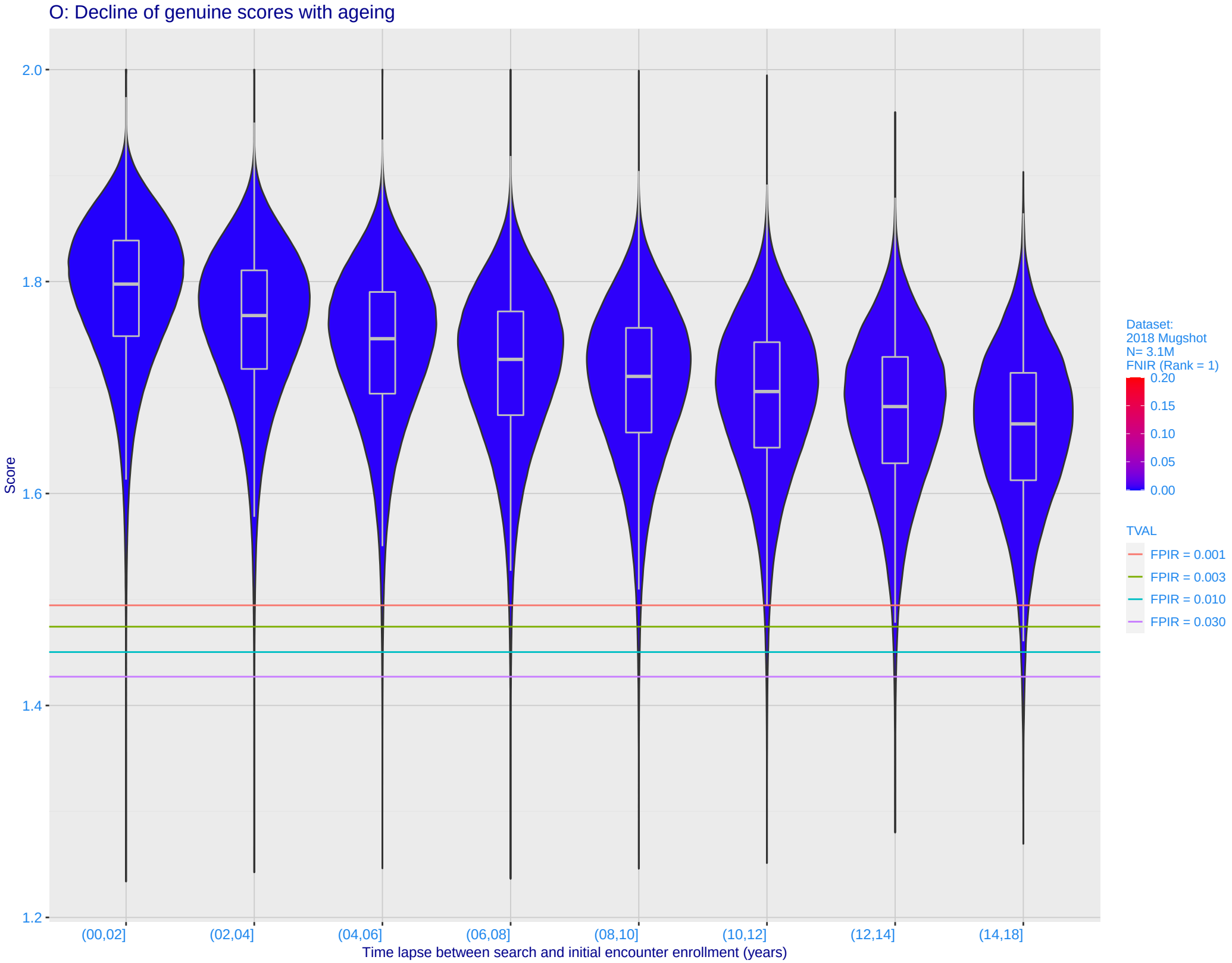
Algorithm: xforwardai_001, Dataset: Border−Crossing Ageing
Threshold: 1.466430 set to achive FPIR(30−45, Male) = 0.001



Age group of person in non−mate probe	Female	Male
(60:99]	0.0130	0.0011
(45:60]	0.0072	0.0008
(30:45]	0.0065	0.0010
(21:30]	0.0102	0.0015
(18:21]	0.0123	0.0029
(15:18]	0.0123	0.0030
(12:15]	0.0118	0.0037

Sex of person in non−mate probe


N: 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
hr_000
xforwardai_001
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


O: Decline of genuine scores with ageing
Score
2.0
1.8
1.6
1.4
1.2
(00,02]
(02,04]
(04,06]
(06,08]
(08,10]
(10,12]
(12,14]
(14,18]
Time lapse between search and initial encounter enrollment (years)
Dataset:
2018 Mugshot
N= 3.1M
FNIR (Rank = 1)
0.20
0.15
0.10
0.05
0.00
TVAL
FPIR = 0.001
FPIR = 0.003
FPIR = 0.010
FPIR = 0.030