A: Datasheet

Algorithm: notiontag_000

Developer: NotionTag Technologies Private Limited

Submission Date: 2022_01_14

Template size: 2120 bytes

Template time (2.5 percentile): 450 msec

Template time (median): 453 msec

Template time (97.5 percentile): 463 msec

Investigation:

Frontal mugshot ranking 314 (out of 631) −− FNIR(1600000, 0, 1) = 0.0021 vs. lowest 0.0004 from qazsmartvisionai_002

Mugshot webcam ranking 261 (out of 593) −− FNIR(1600000, 0, 1) = 0.0122 vs. lowest 0.0050 from qazsmartvisionai_003

Mugshot profile ranking 274 (out of 562) −− FNIR(1600000, 0, 1) = 0.1952 vs. lowest 0.0390 from qazsmartvisionai_002

Immigration visa−border ranking 250 (out of 513) −− FNIR(1600000, 0, 1) = 0.0048 vs. lowest 0.0008 from qazsmartvisionai_002

Immigration visa−kiosk ranking 265 (out of 464) −− FNIR(1600000, 0, 1) = 0.0868 vs. lowest 0.0337 from viante_002

Identification:

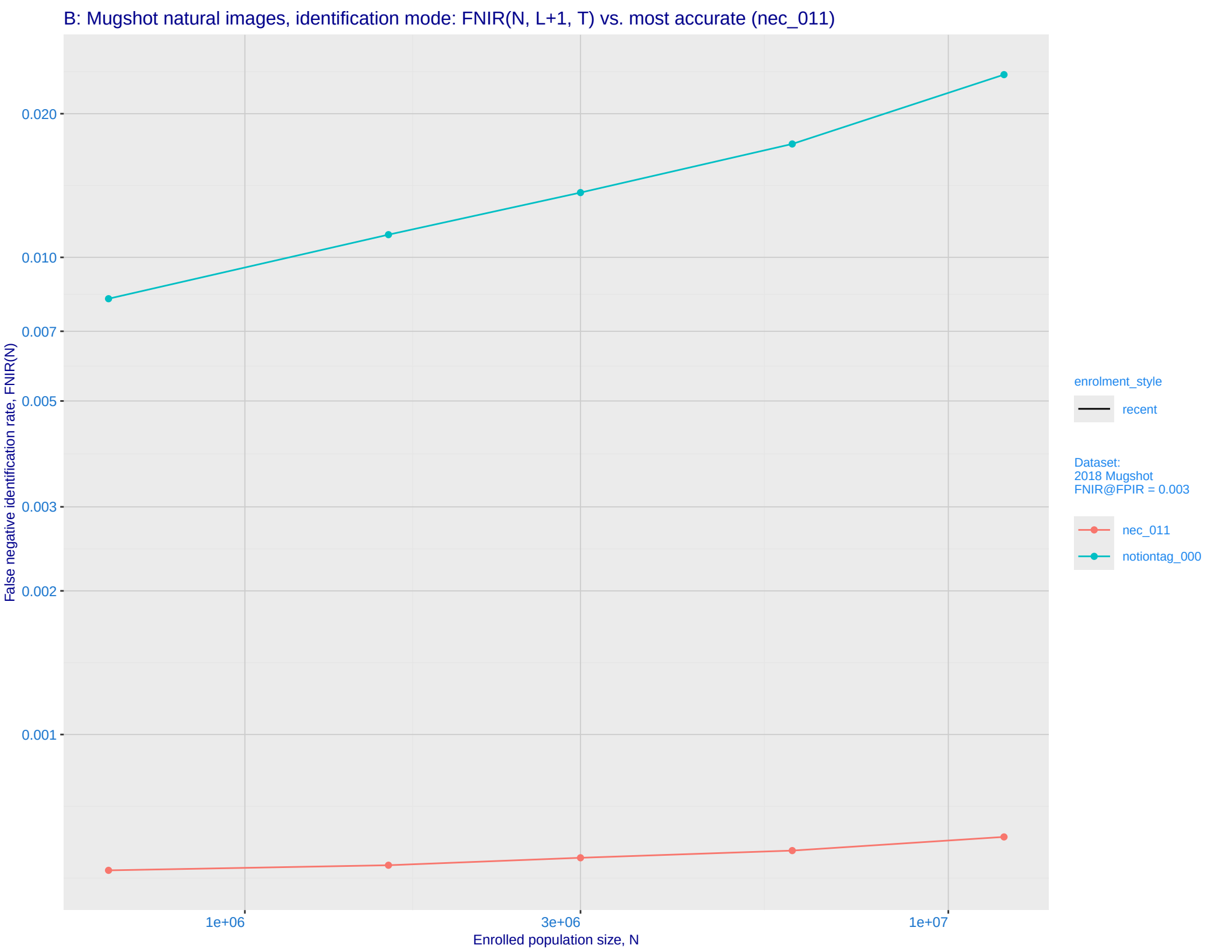
Frontal mugshot ranking 290 (out of 631) −− FNIR(1600000, T, L+1) = 0.0112, FPIR=0.003004 vs. lowest 0.0005 from qazsmartvisionai_003

Mugshot webcam ranking 270 (out of 591) −− FNIR(1600000, T, L+1) = 0.0465, FPIR=0.002998 vs. lowest 0.0056 from qazsmartvisionai_003

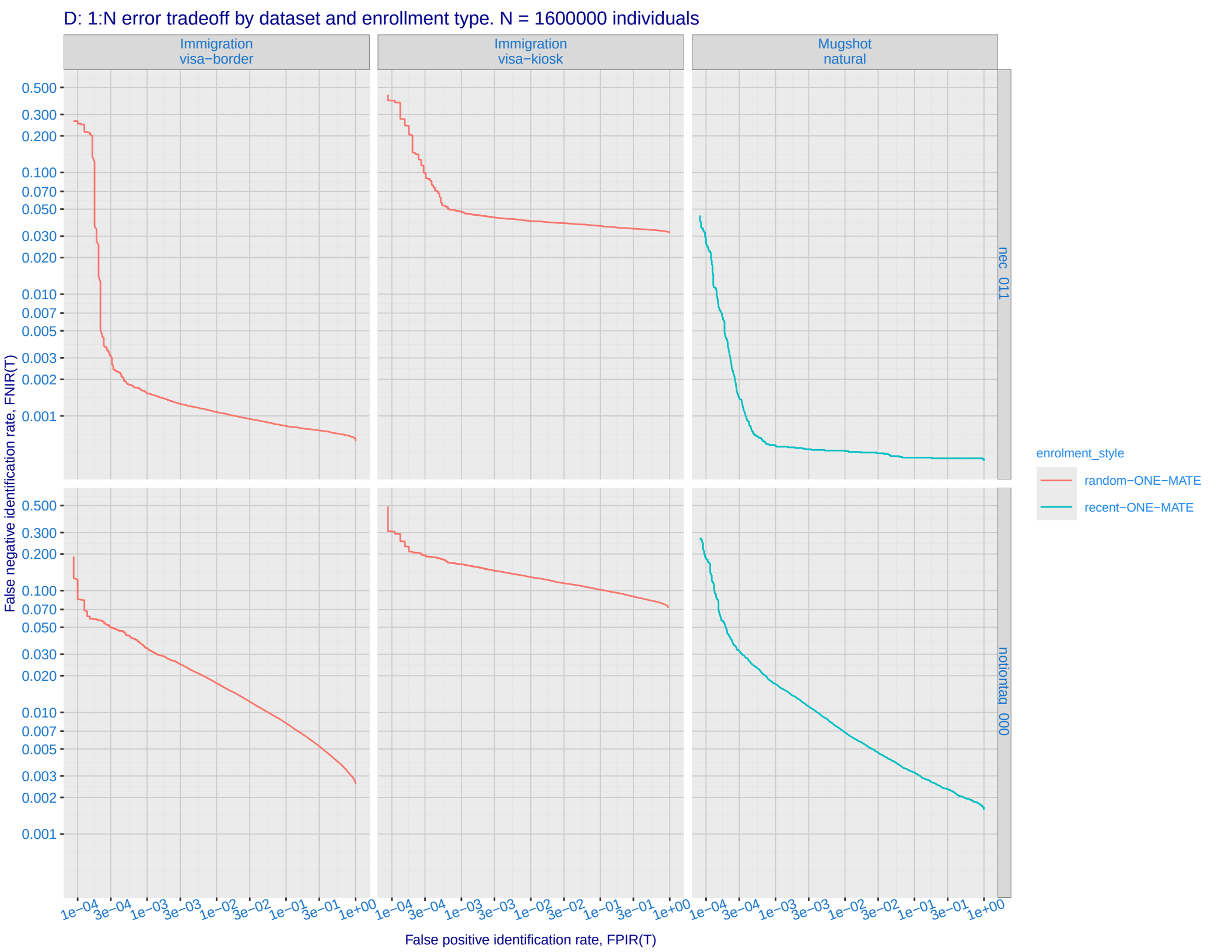
Mugshot profile ranking 205 (out of 561) −− FNIR(1600000, T, L+1) = 0.5380, FPIR=0.003010 vs. lowest 0.0460 from qazsmartvisionai_002

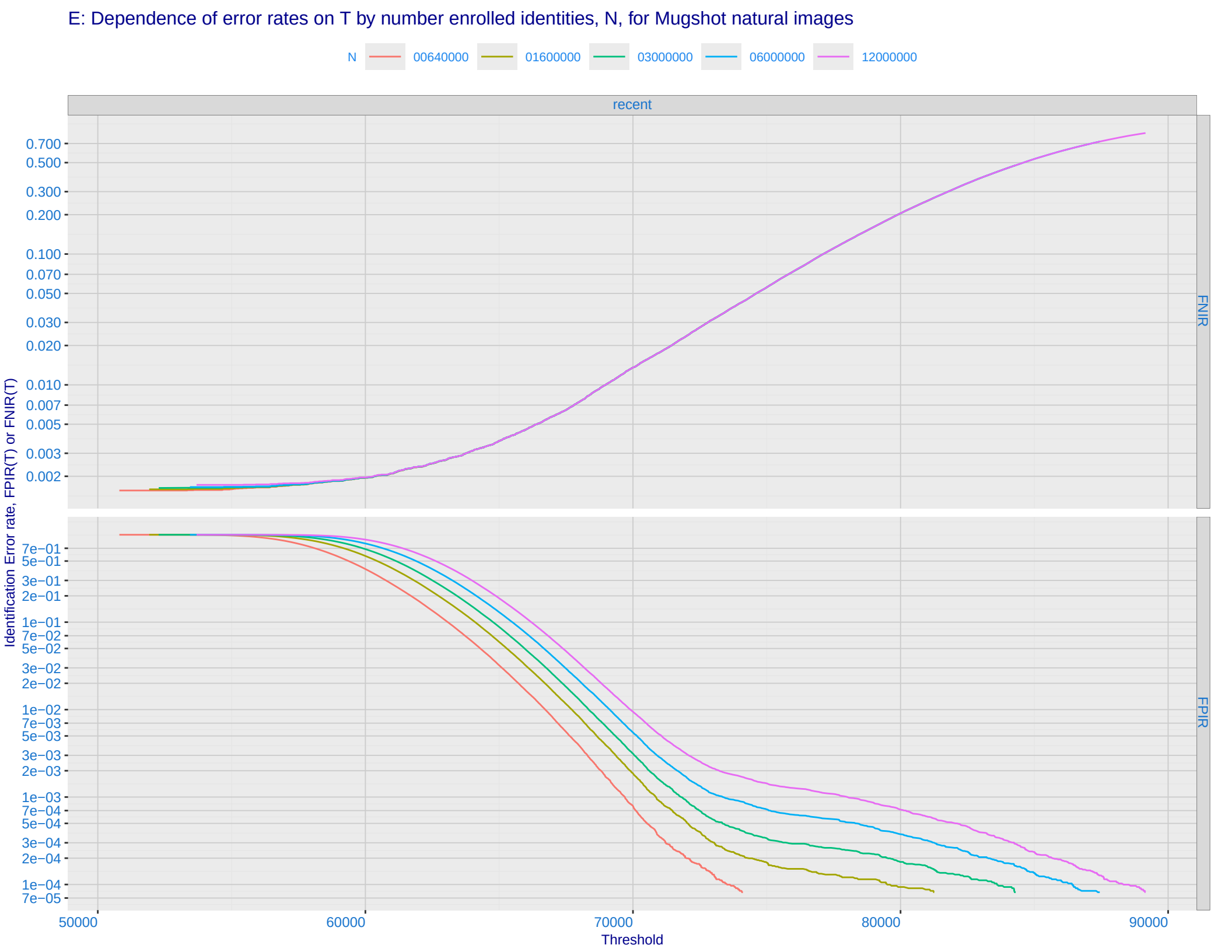
Immigration visa−border ranking 240 (out of 512) −− FNIR(1600000, T, L+1) = 0.0249, FPIR=0.002988 vs. lowest 0.0013 from nec_011

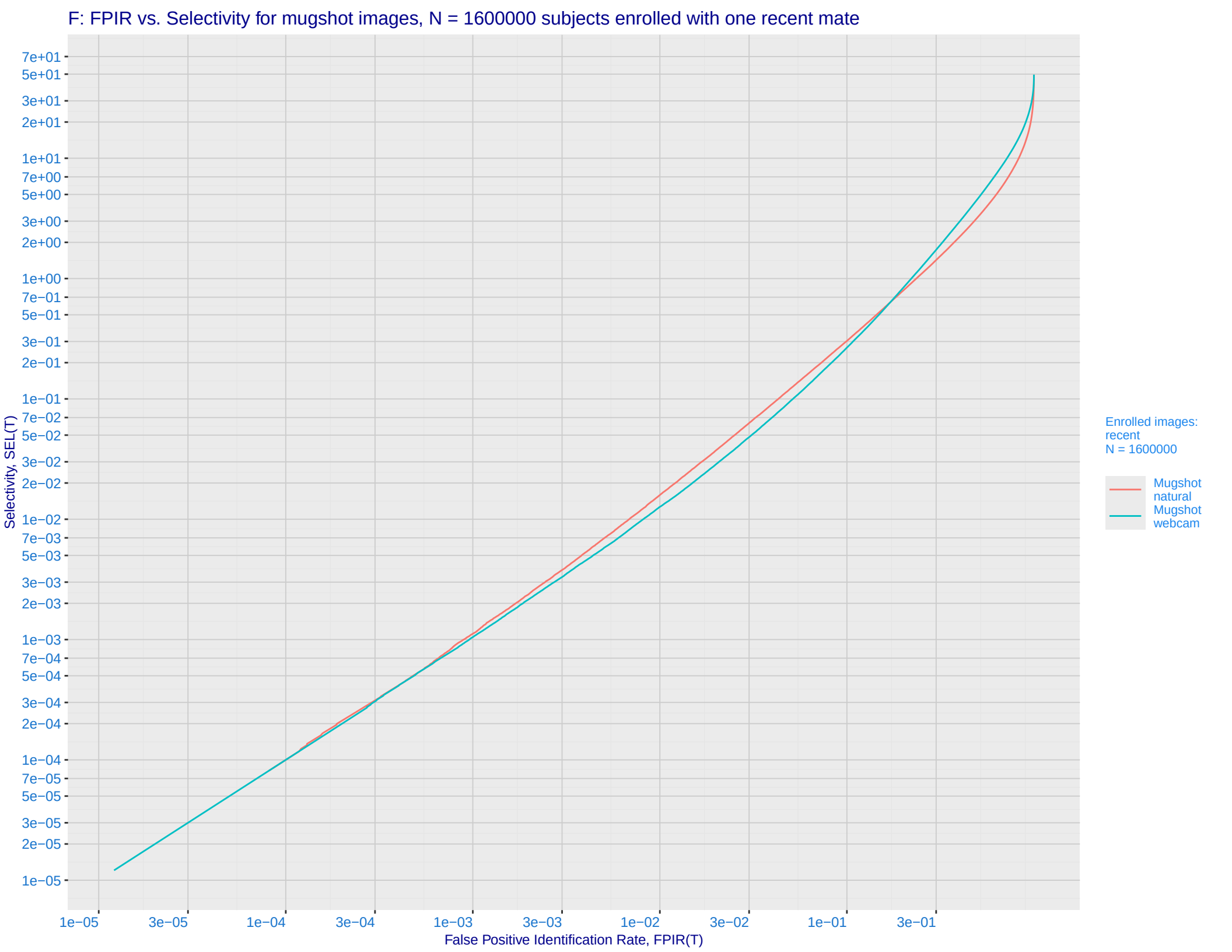
Immigration visa−kiosk ranking 221 (out of 464) −− FNIR(1600000, T, L+1) = 0.1461, FPIR=0.002992 vs. lowest 0.0427 from nec_011

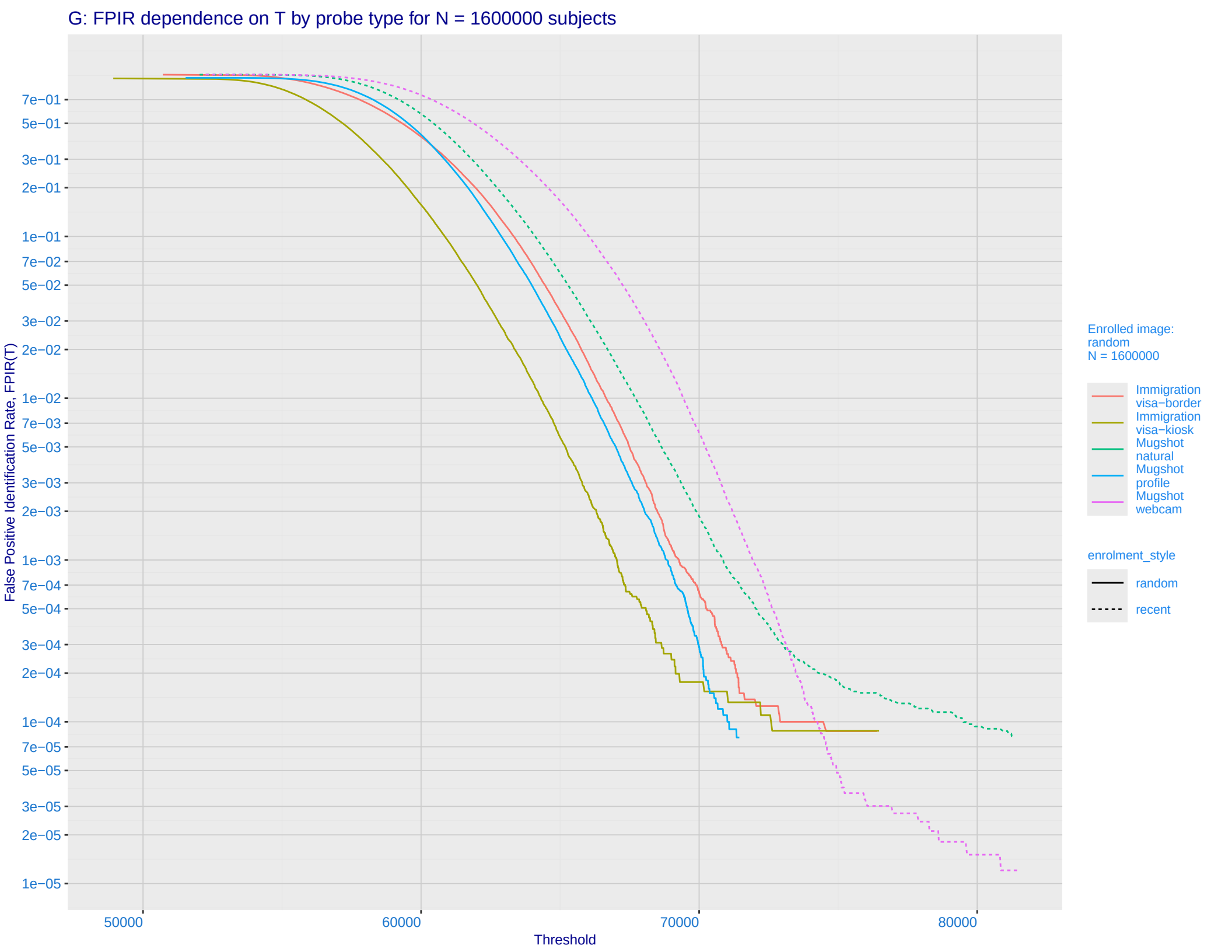

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (nec_011)
False negative identification rate, FNIR(N)
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
recent
Dataset:
2018 Mugshot
FNIR@FPIR = 0.003
nec_011
notiontag_000

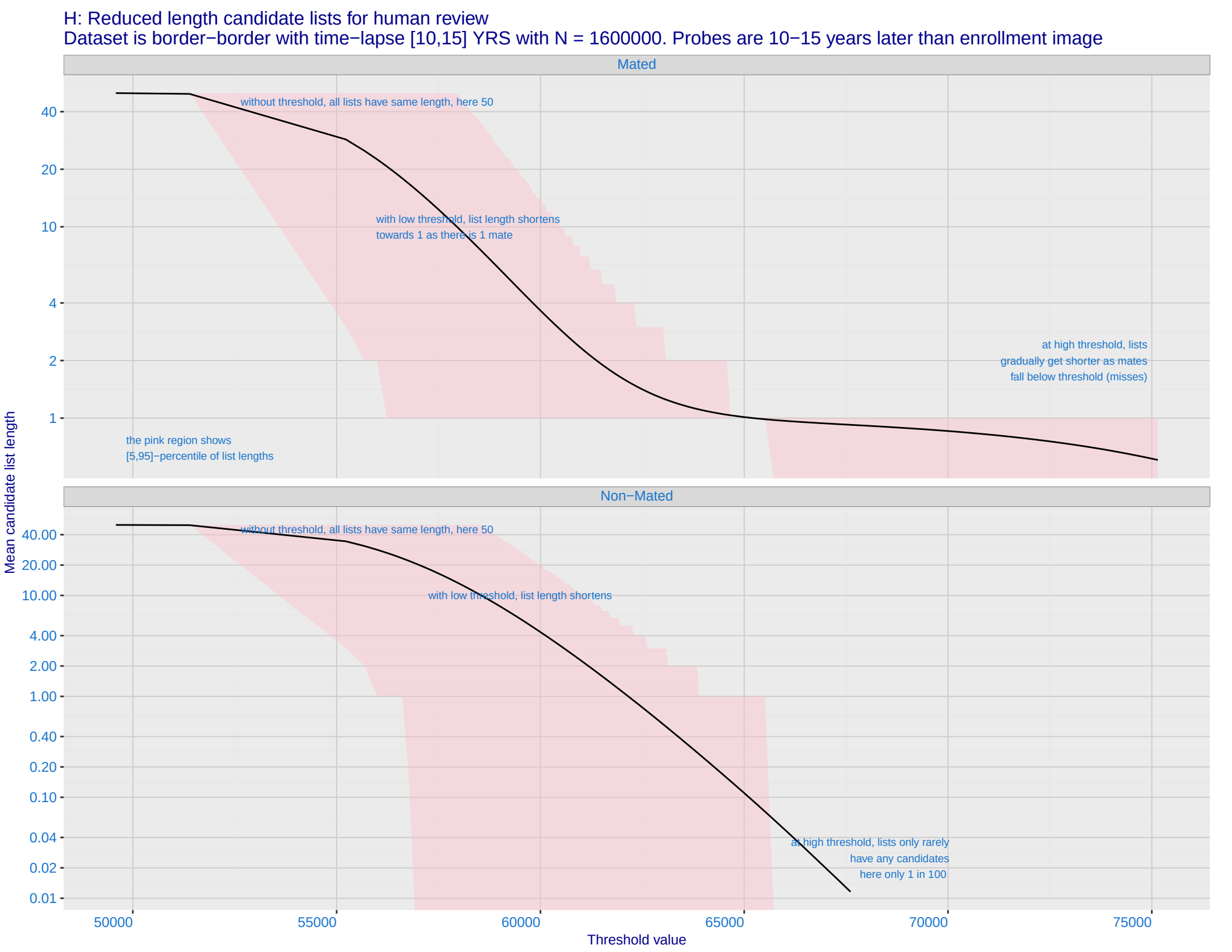

C: Evolution of accuracy for NOTIONTAG algorithms on three datasets 2018 − present
False negative identification rate (FNIR) at false match rate (FPIR) = 0.010000
0.20
0.10
0.08
0.06
0.05
0.04
0.03
0.02
0.01
Jan 14
Date algorithm submitted to FRVT
Dataset
Mugshot−Mugshot
Mugshot−ProfileView
Mugshot−Webcam
Visa−Border
Visa−Kiosk

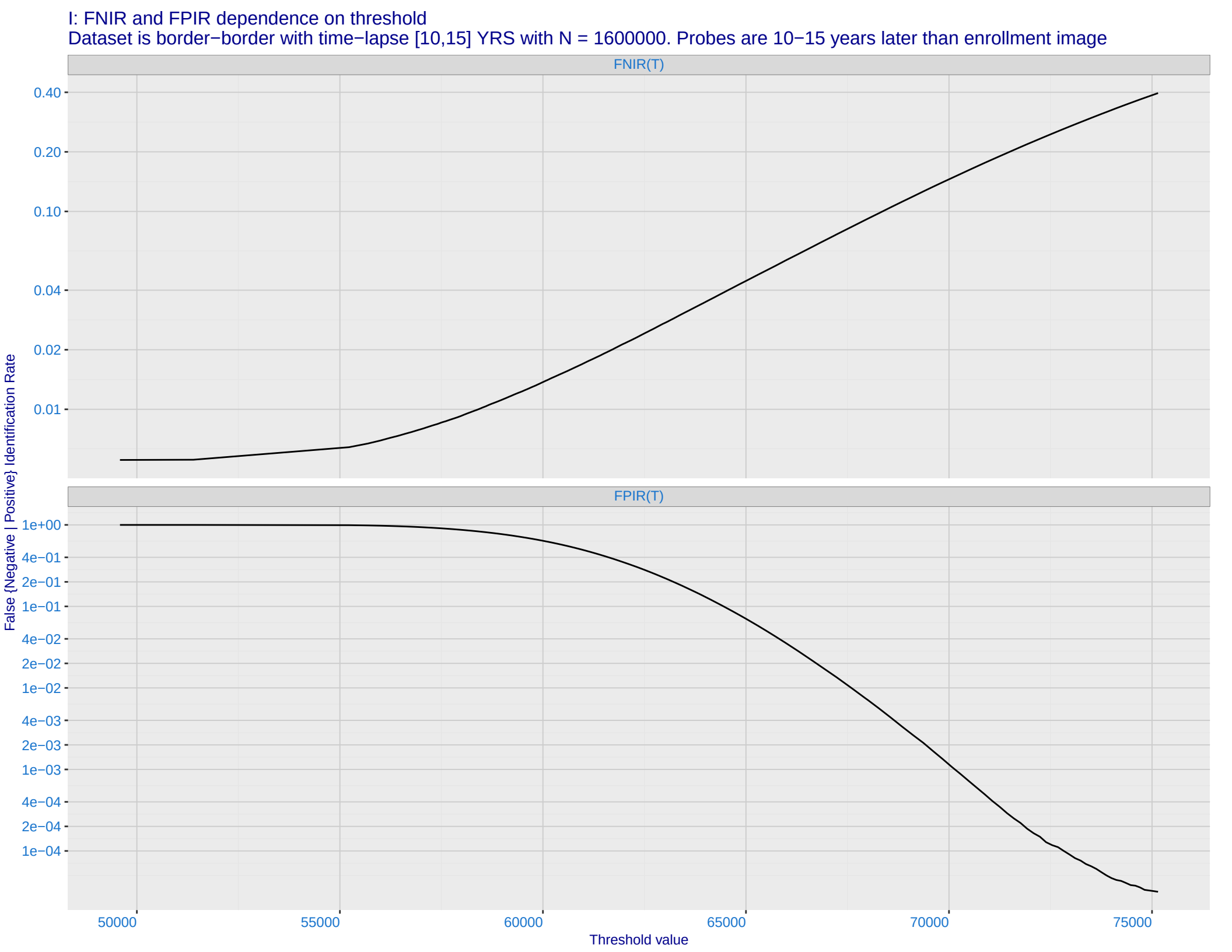

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
nec_011
notiontag_000
False negative identification rate, FNIR(T)
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
1e+00
False positive identification rate, FPIR(T)
enrolment_style
random−ONE−MATE
recent−ONE−MATE

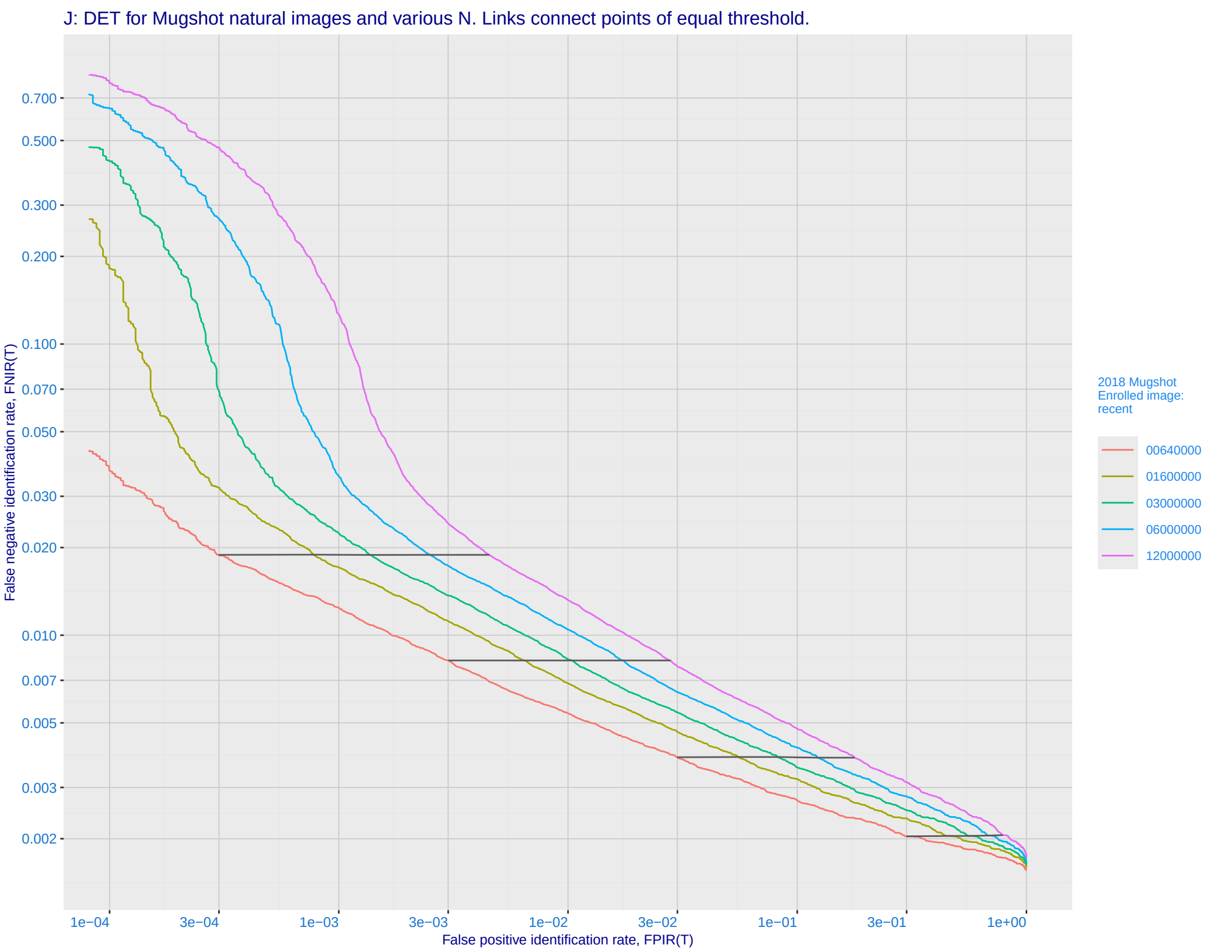

E: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images
N
00640000
01600000
03000000
06000000
12000000
recent
FNIR
FPIR
Identification Error rate, FPIR(T) or FNIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
7e−01
5e−01
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
50000
60000
70000
80000
90000
Threshold

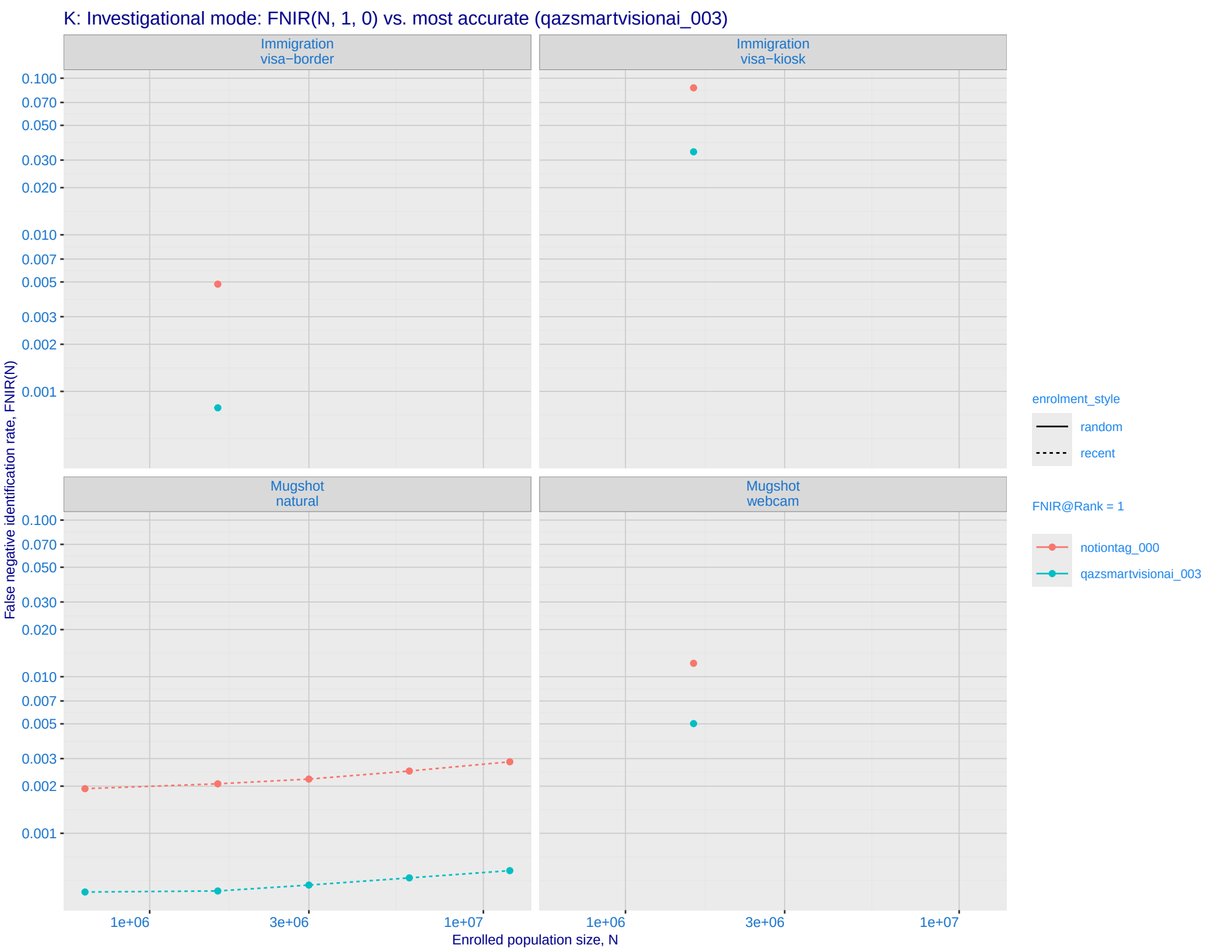

F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate
Selectivity, SEL(T)
7e+01
5e+01
3e+01
2e+01
1e+01
7e+00
5e+00
3e+00
2e+00
1e+00
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
1e−05
3e−05
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
False Positive Identification Rate, FPIR(T)
Enrolled images:
recent
N = 1600000
Mugshot
natural
Mugshot
webcam

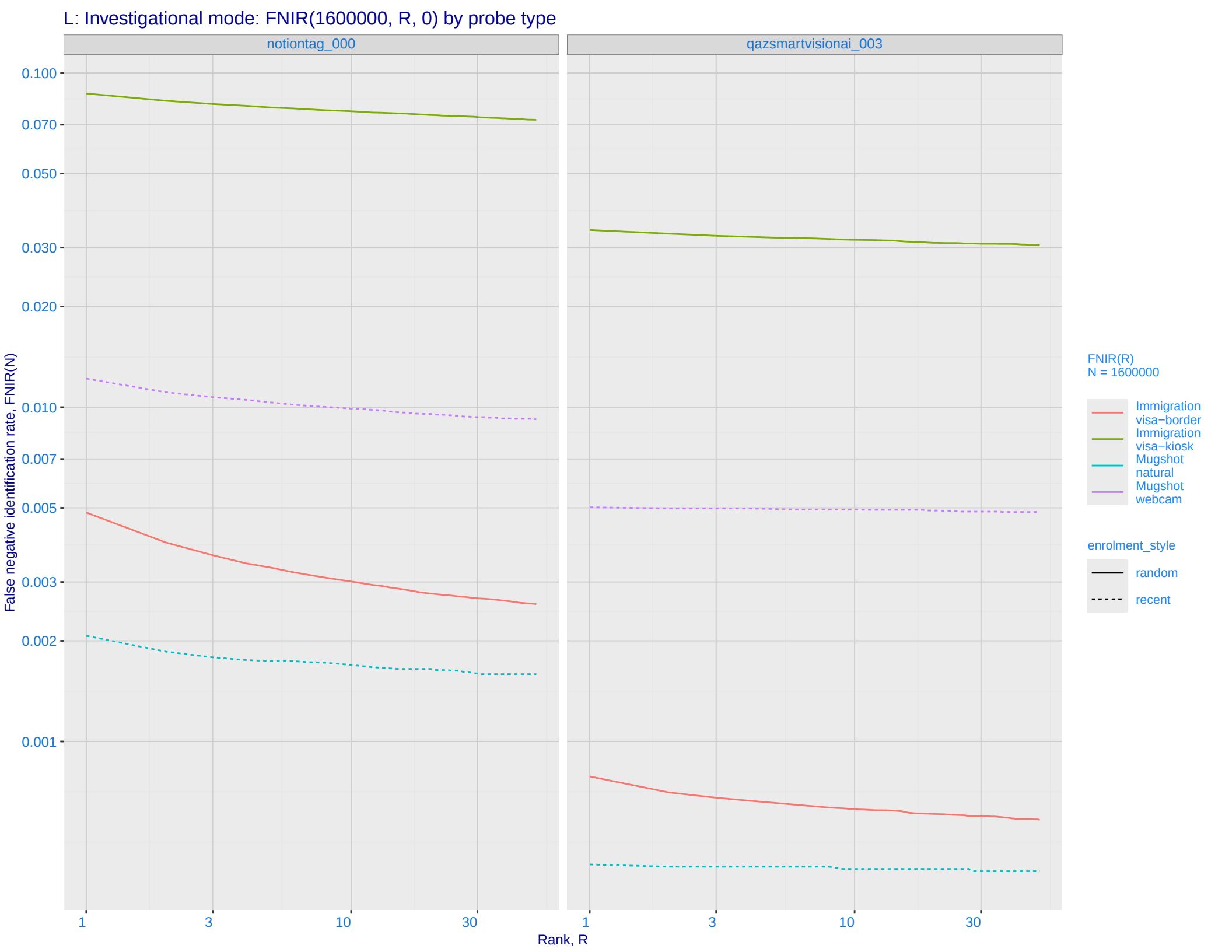

G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Identification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
50000
60000
70000
80000
Threshold
Enrolled image:
random
N = 1600000
Immigration
visa−border
Immigration
visa−kiosk
Mugshot
natural
Mugshot
profile
Mugshot
webcam
enrolment_style
random
recent

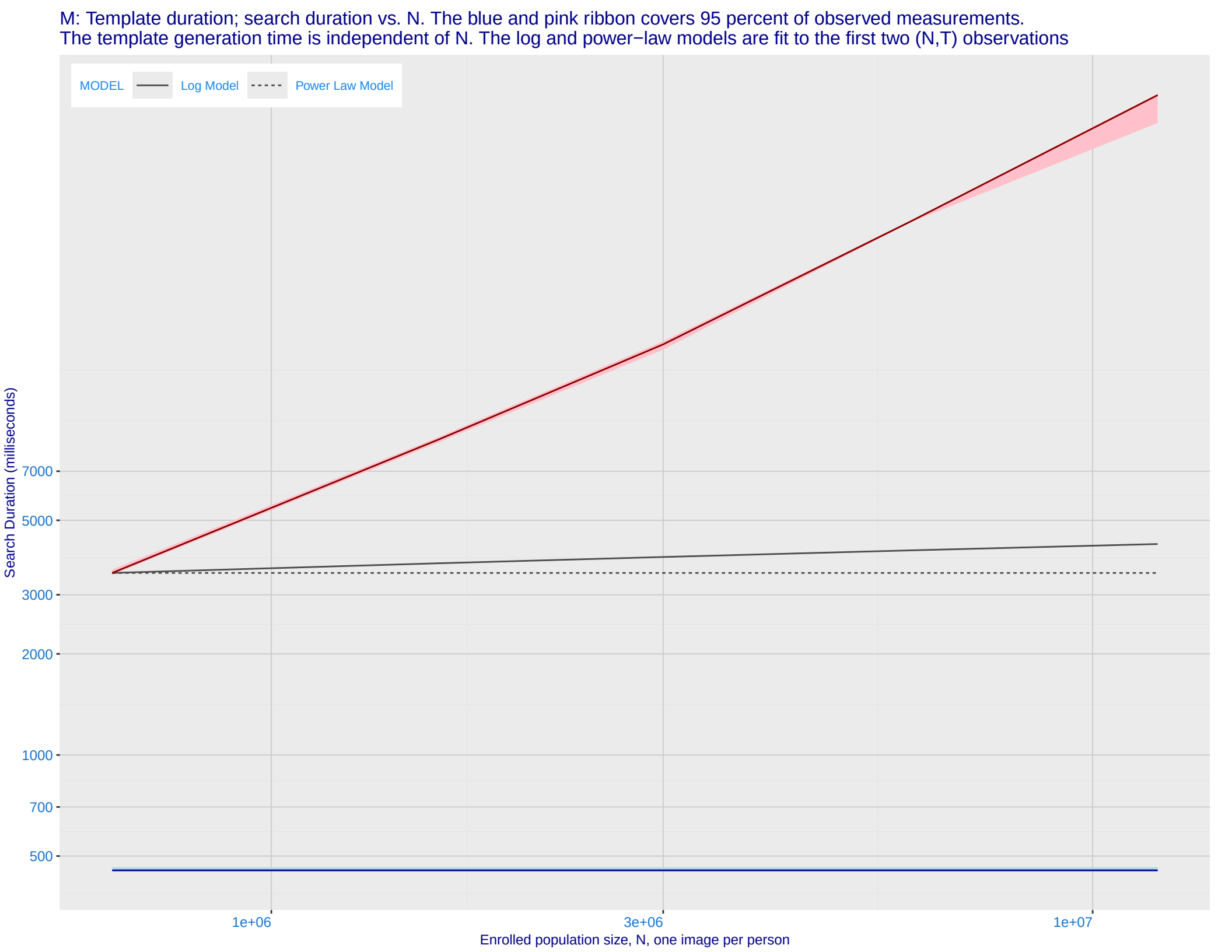

H: Reduced length candidate lists for human review
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
Mated
without threshold, all lists have same length, here 50
with low threshold, list length shortens
towards 1 as there is 1 mate
at high threshold, lists
gradually get shorter as mates
fall below threshold (misses)
the pink region shows
[5,95]−percentile of list lengths
Non−Mated
without threshold, all lists have same length, here 50
with low threshold, list length shortens
at high threshold, lists only rarely
have any candidates
here only 1 in 100
Mean candidate list length
Threshold value

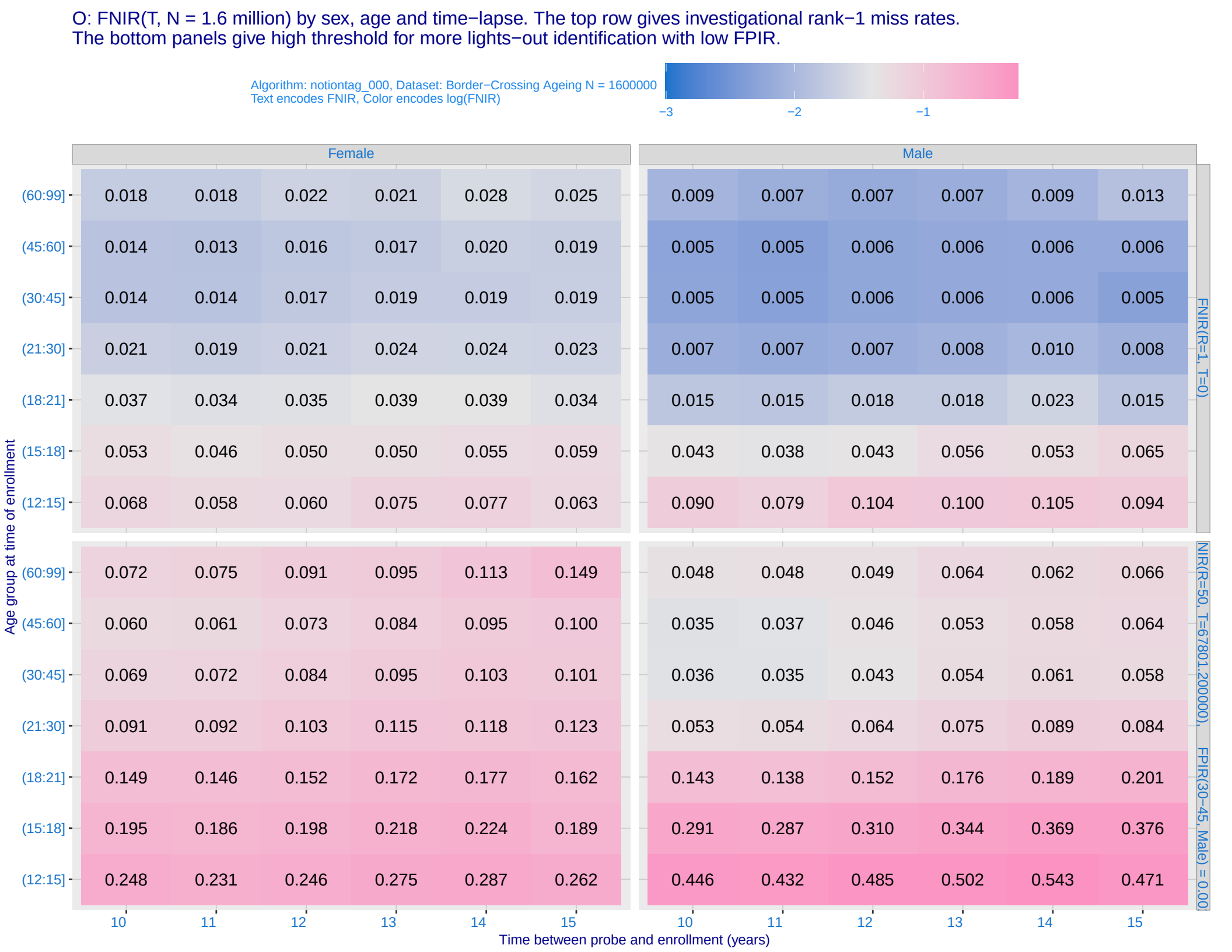

I: FNIR and FPIR dependence on threshold
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
FNIR(T)
0.40
0.20
0.10
0.04
0.02
0.01
FPIR(T)
1e+00
4e−01
2e−01
1e−01
4e−02
2e−02
1e−02
4e−03
2e−03
1e−03
4e−04
2e−04
1e−04
False {Negative | Positive} Identification Rate
50000
55000
60000
65000
70000
75000
Threshold value


J: DET for Mugshot natural images and various N. Links connect points of equal threshold.
False negative identification rate, FNIR(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
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
1e+00
False positive identification rate, FPIR(T)
2018 Mugshot
Enrolled image:
recent
00640000
01600000
03000000
06000000
12000000

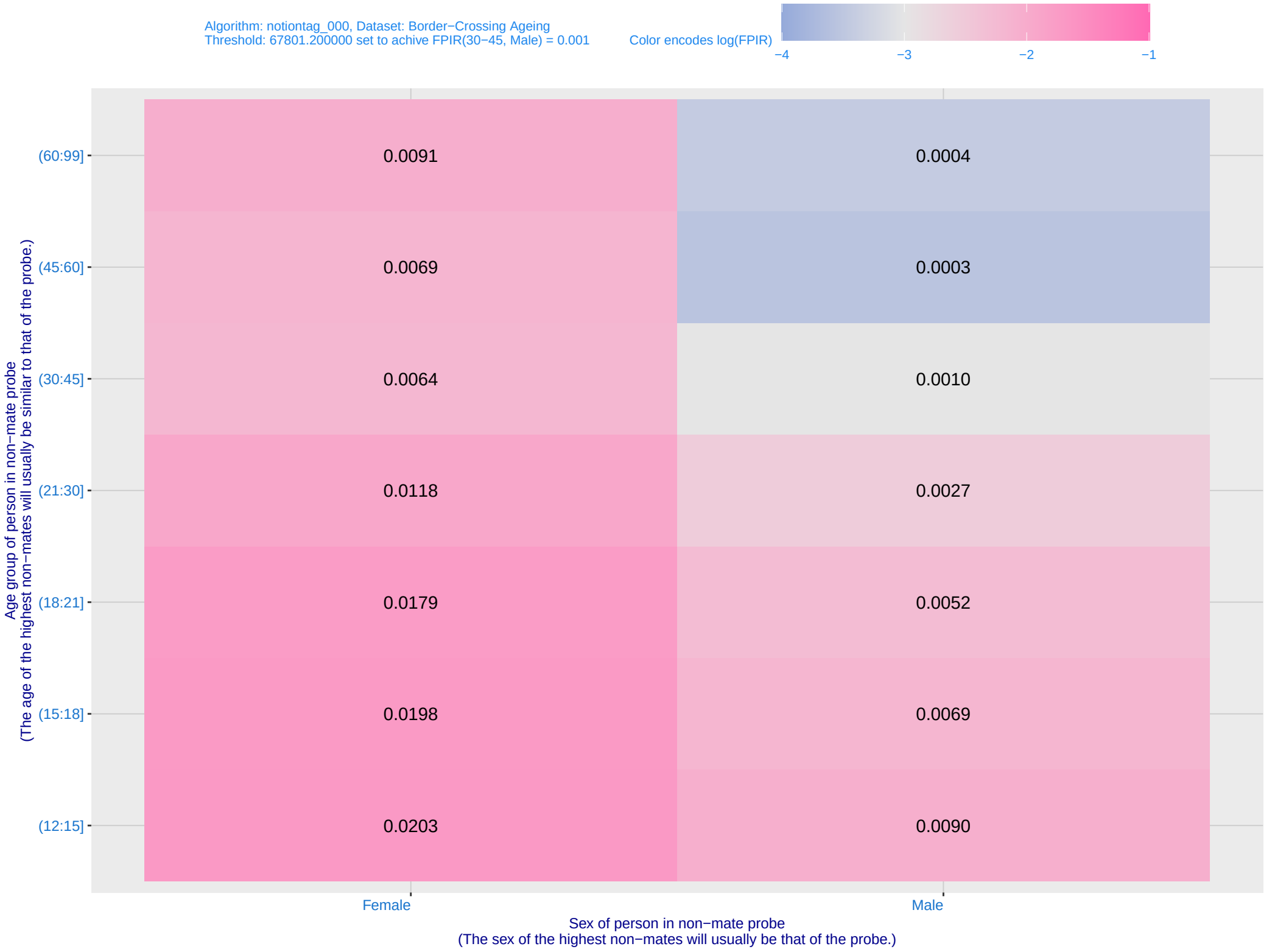

K: Investigational mode: FNIR(N, 1, 0) vs. most accurate (qazsmartvisionai_003)
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam
False negative identification rate, FNIR(N)
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
random
recent
FNIR@Rank = 1
notiontag_000
qazsmartvisionai_003

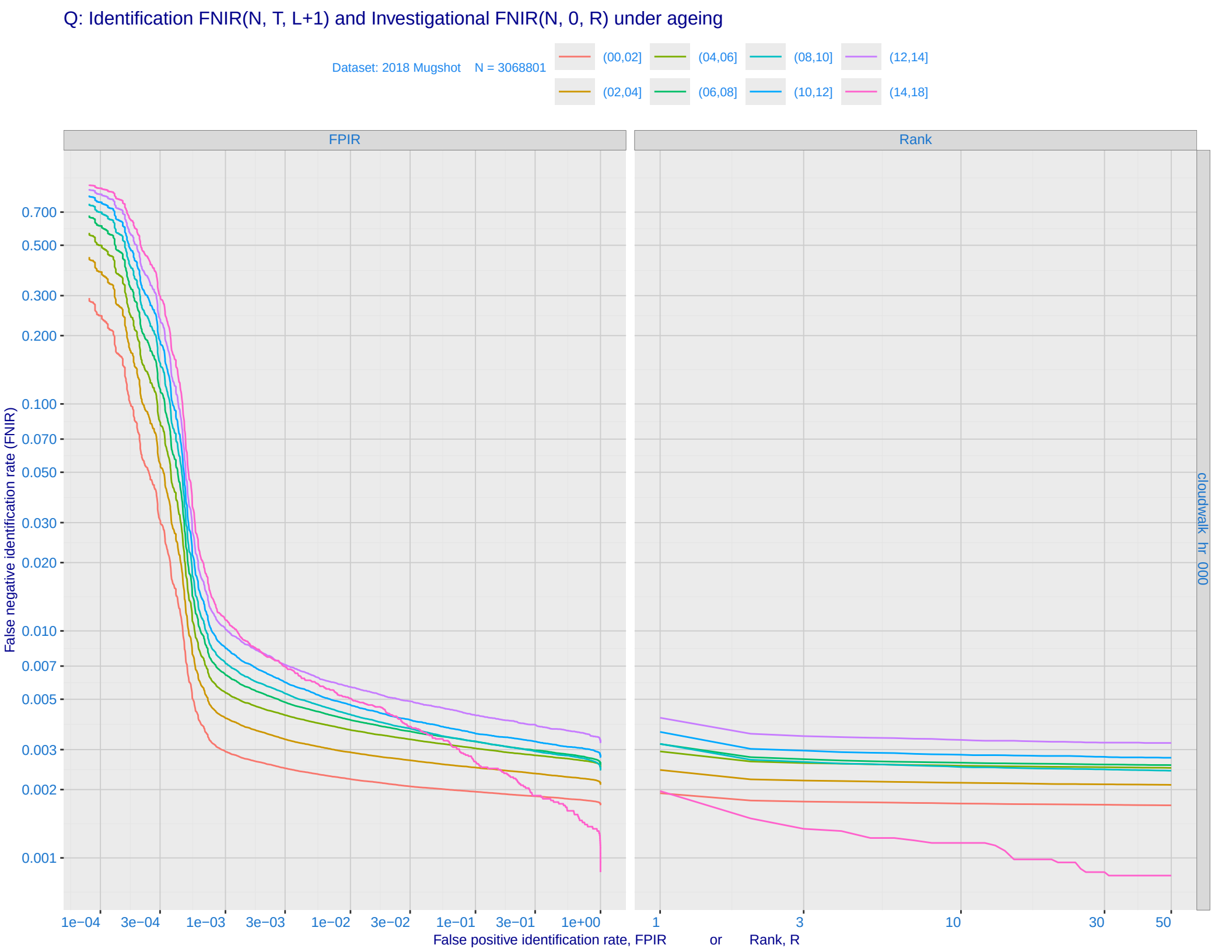

L: Investigational mode: FNIR(1600000, R, 0) by probe type
notiontag_000
qazsmartvisionai_003
False negative identification rate, FNIR(N)
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1
3
10
30
Rank, R
FNIR(R)
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam
enrolment_style
random
recent


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
MODEL
Log Model
Power Law Model
Search Duration (milliseconds)
7000
5000
3000
2000
1000
700
500
1e+06
3e+06
1e+07
Enrolled population size, N, one image per person


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: notiontag_000, Dataset: Border−Crossing Ageing N = 1600000
Text encodes FNIR, Color encodes log(FNIR)
−3
−2
−1
Female
Male
(60:99]
(45:60]
(30:45]
(21:30]
(18:21]
(15:18]
(12:15]
0.018 0.018 0.022 0.021 0.028 0.025
0.014 0.013 0.016 0.017 0.020 0.019
0.014 0.014 0.017 0.019 0.019 0.019
0.021 0.019 0.021 0.024 0.024 0.023
0.037 0.034 0.035 0.039 0.039 0.034
0.053 0.046 0.050 0.050 0.055 0.059
0.068 0.058 0.060 0.075 0.077 0.063
0.009 0.007 0.007 0.007 0.009 0.013
0.005 0.005 0.006 0.006 0.006 0.006
0.005 0.005 0.006 0.006 0.006 0.005
0.007 0.007 0.007 0.008 0.010 0.008
0.015 0.015 0.018 0.018 0.023 0.015
0.043 0.038 0.043 0.056 0.053 0.065
0.090 0.079 0.104 0.100 0.105 0.094
FNIR(R=1, T=0)
0.072 0.075 0.091 0.095 0.113 0.149
0.060 0.061 0.073 0.084 0.095 0.100
0.069 0.072 0.084 0.095 0.103 0.101
0.091 0.092 0.103 0.115 0.118 0.123
0.149 0.146 0.152 0.172 0.177 0.162
0.195 0.186 0.198 0.218 0.224 0.189
0.248 0.231 0.246 0.275 0.287 0.262
0.048 0.048 0.049 0.064 0.062 0.066
0.035 0.037 0.046 0.053 0.058 0.064
0.036 0.035 0.043 0.054 0.061 0.058
0.053 0.054 0.064 0.075 0.089 0.084
0.143 0.138 0.152 0.176 0.189 0.201
0.291 0.287 0.310 0.344 0.369 0.376
0.446 0.432 0.485 0.502 0.543 0.471
FNIR(R=50, T=67801.200000), FPIR(30−45, Male) = 0.00
Age group at time of enrollment
10 11 12 13 14 15
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
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
cloudwalk_hr_000