A: Datasheet

Algorithm: idemia_009

Developer: Idemia

Submission Date: 2022_03_01

Template size: 636 bytes

Template time (2.5 percentile): 870 msec

Template time (median): 874 msec

Template time (97.5 percentile): 891 msec

Investigation:

Frontal mugshot ranking 4 (out of 341) −− FNIR(1600000, 0, 1) = 0.0010 vs. lowest 0.0008 from sensetime_007

Mugshot webcam ranking 5 (out of 303) −− FNIR(1600000, 0, 1) = 0.0064 vs. lowest 0.0056 from sensetime_007

Mugshot profile ranking 11 (out of 272) −− FNIR(1600000, 0, 1) = 0.0654 vs. lowest 0.0521 from sensetime_007

Immigration visa−border ranking 3 (out of 230) −− FNIR(1600000, 0, 1) = 0.0010 vs. lowest 0.0008 from sensetime_007

Immigration visa−kiosk ranking 3 (out of 227) −− FNIR(1600000, 0, 1) = 0.0513 vs. lowest 0.0487 from cubox_000

Identification:

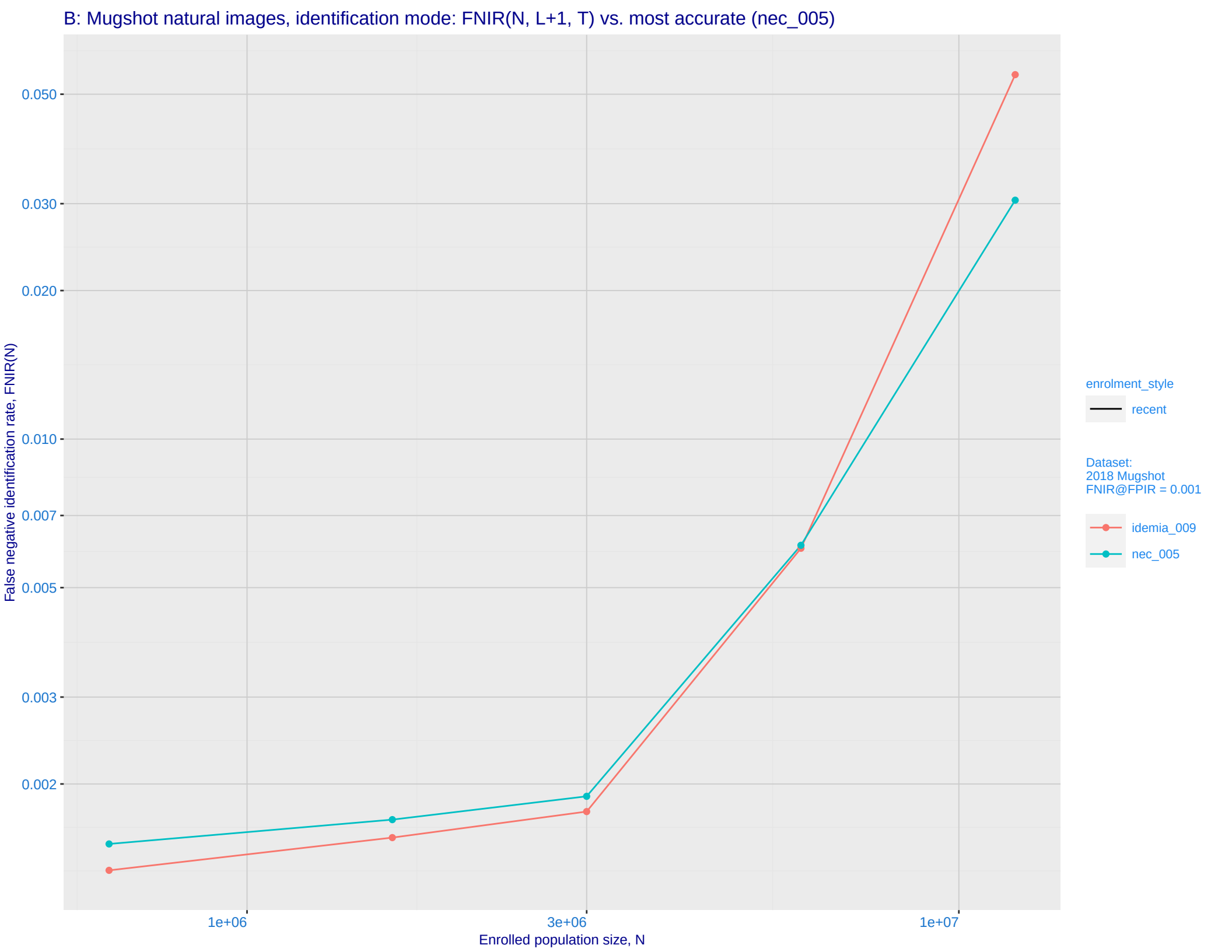
Frontal mugshot ranking 2 (out of 341) −− FNIR(1600000, T, L+1) = 0.0016, FPIR=0.001000 vs. lowest 0.0014 from sensetime_007

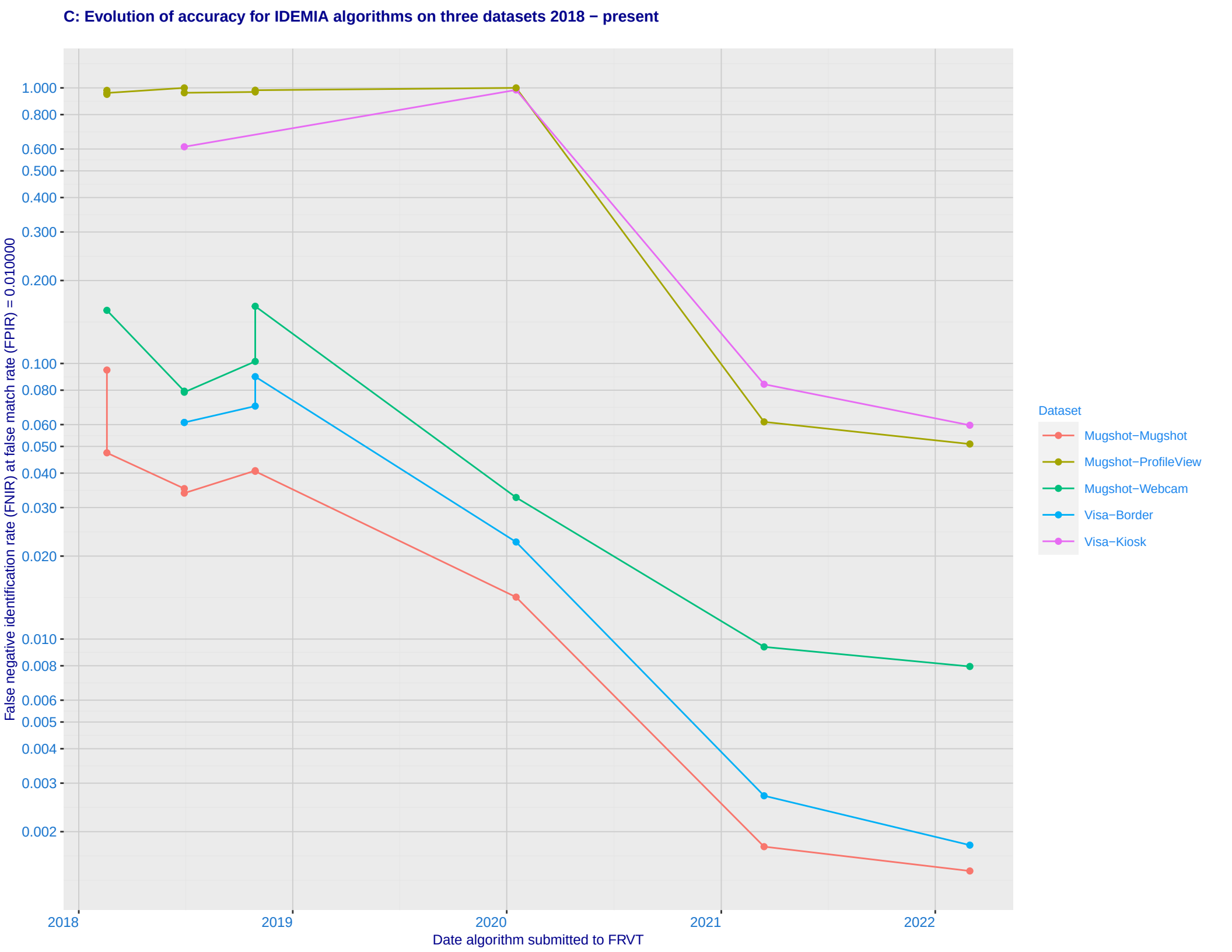
Mugshot webcam ranking 2 (out of 301) −− FNIR(1600000, T, L+1) = 0.0106, FPIR=0.001000 vs. lowest 0.0093 from sensetime_007

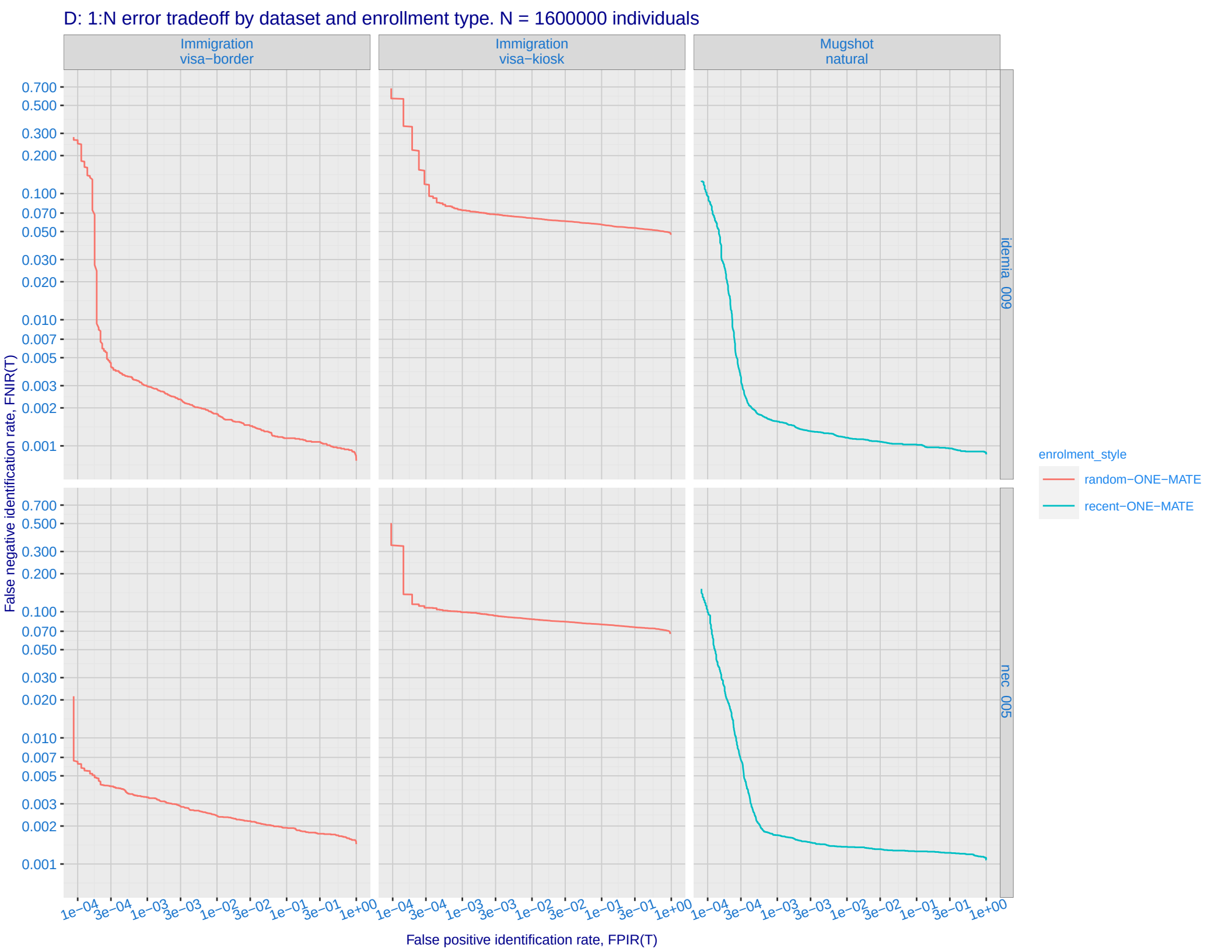
Mugshot profile ranking 3 (out of 271) −− FNIR(1600000, T, L+1) = 0.1413, FPIR=0.001000 vs. lowest 0.1093 from cloudwalk_mt_000

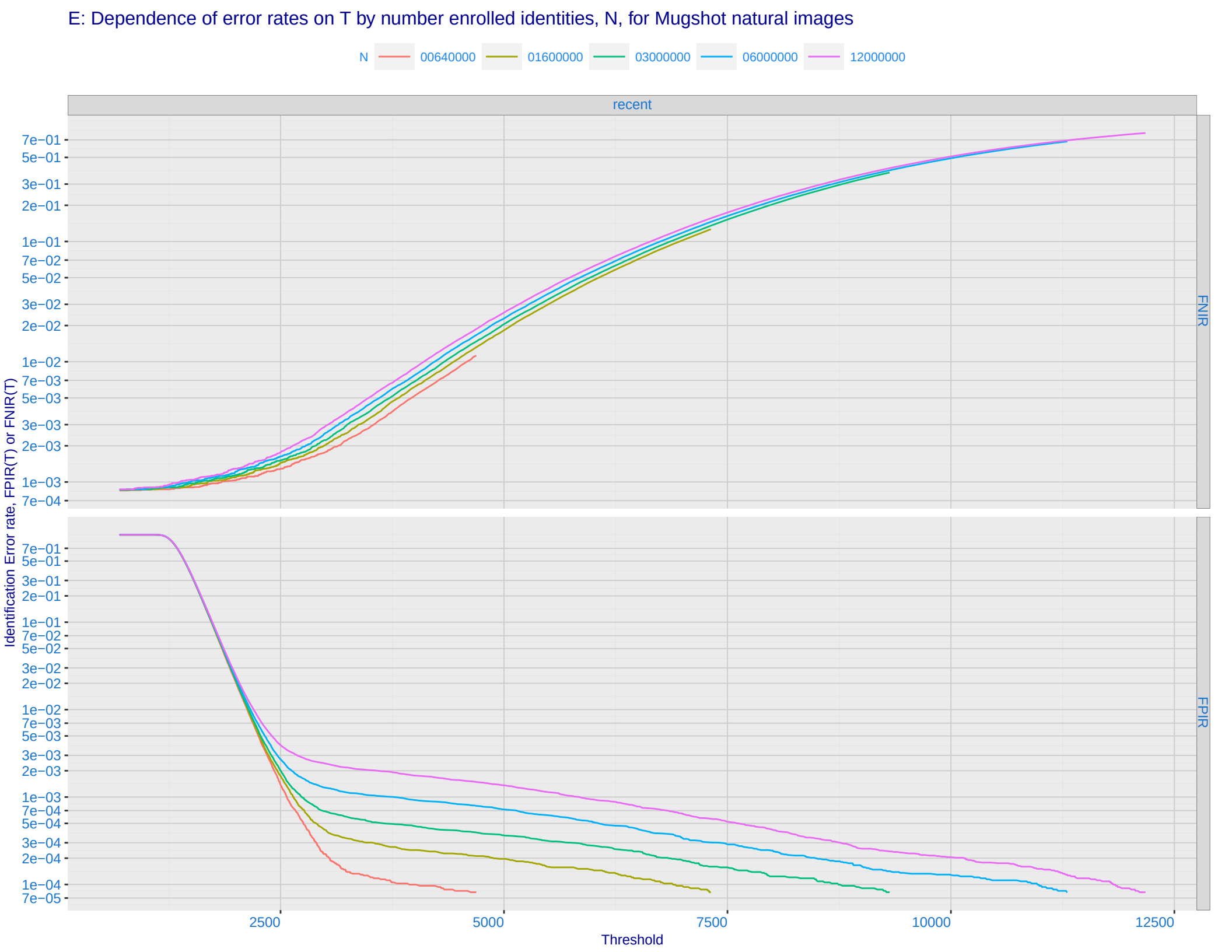
Immigration visa−border ranking 3 (out of 229) −− FNIR(1600000, T, L+1) = 0.0030, FPIR=0.001000 vs. lowest 0.0024 from cloudwalk_mt_000

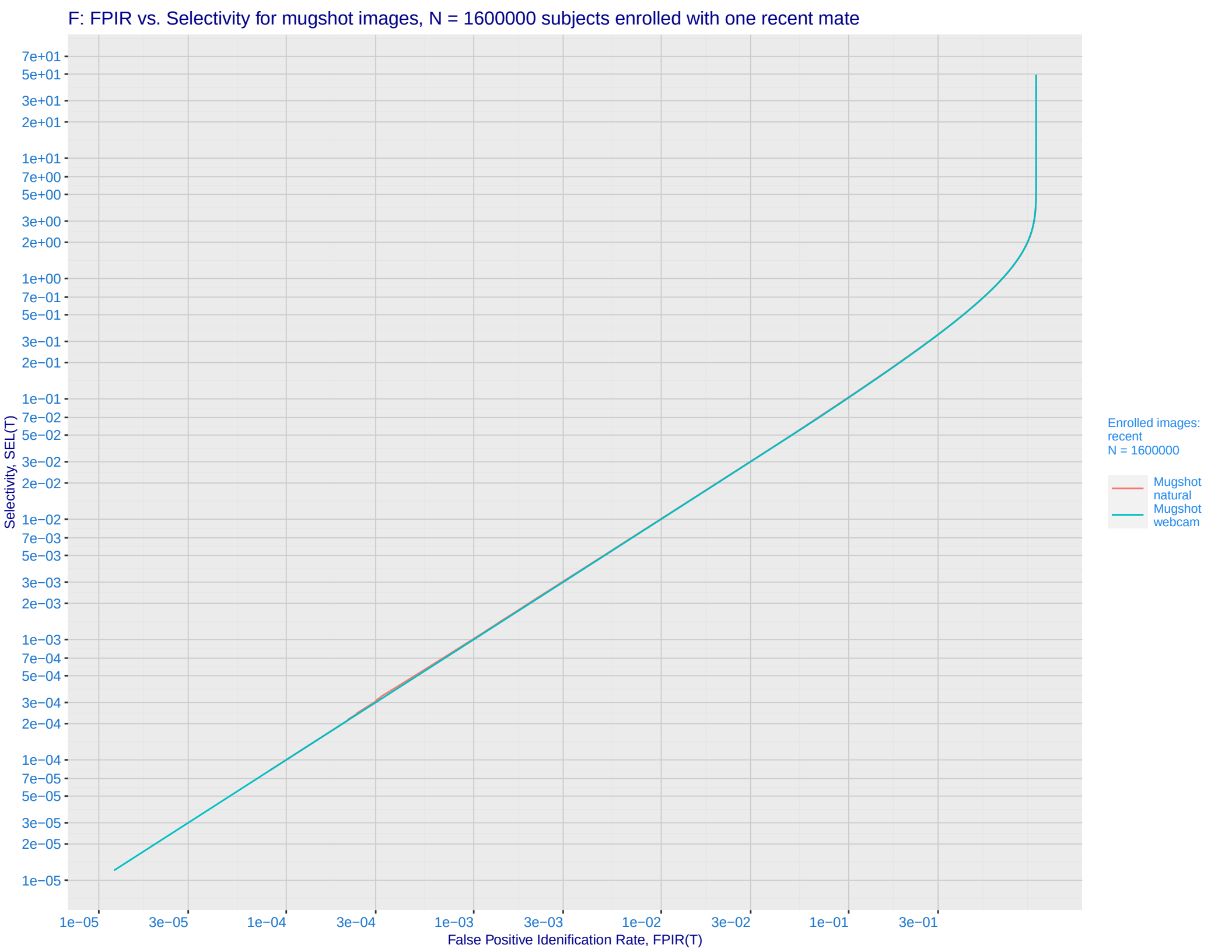
Immigration visa−kiosk ranking 4 (out of 224) −− FNIR(1600000, T, L+1) = 0.0740, FPIR=0.001000 vs. lowest 0.0719 from cloudwalk_mt_000

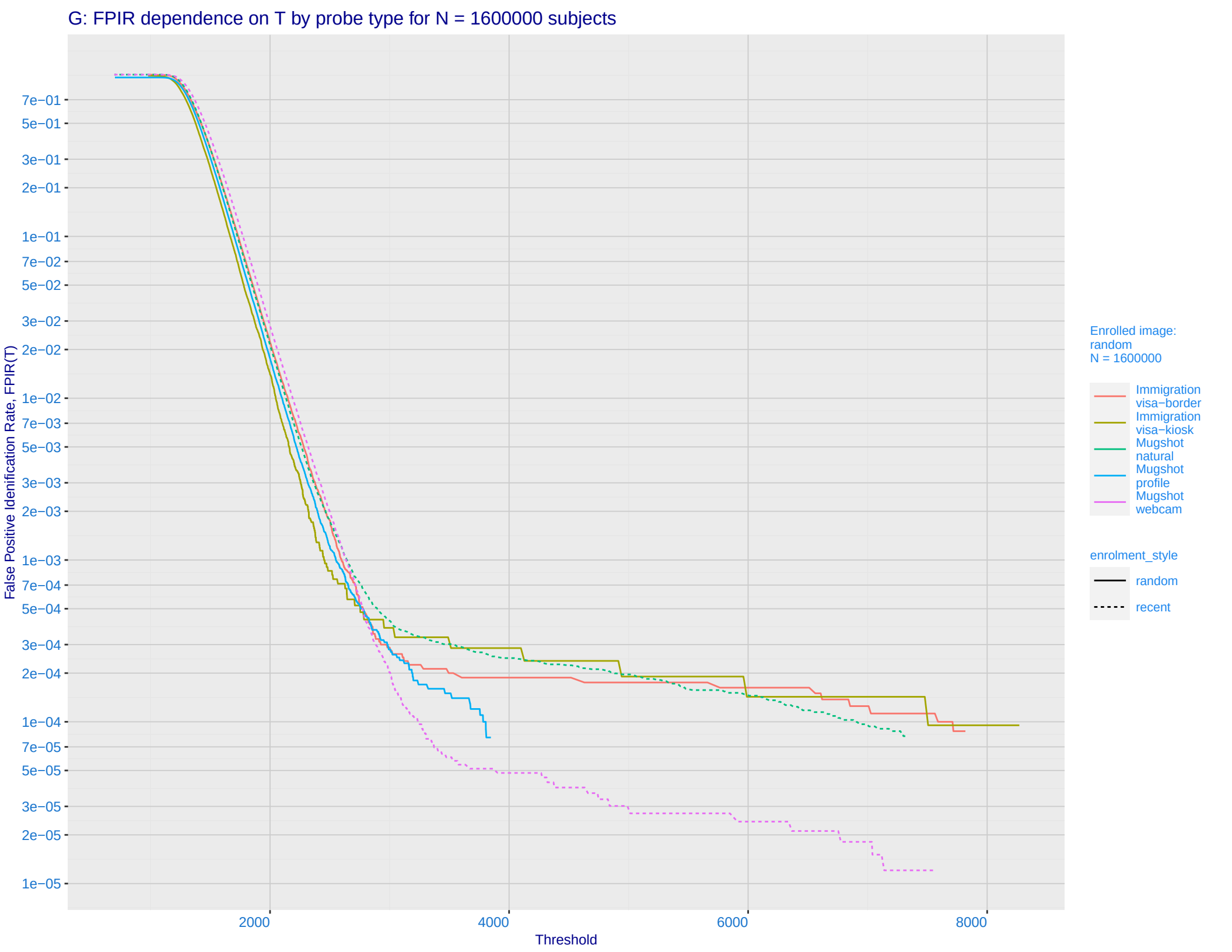

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (nec_005)
False negative identification rate, FNIR(N)
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
recent
Dataset:
2018 Mugshot
FNIR@FPIR = 0.001
idemia_009
nec_005

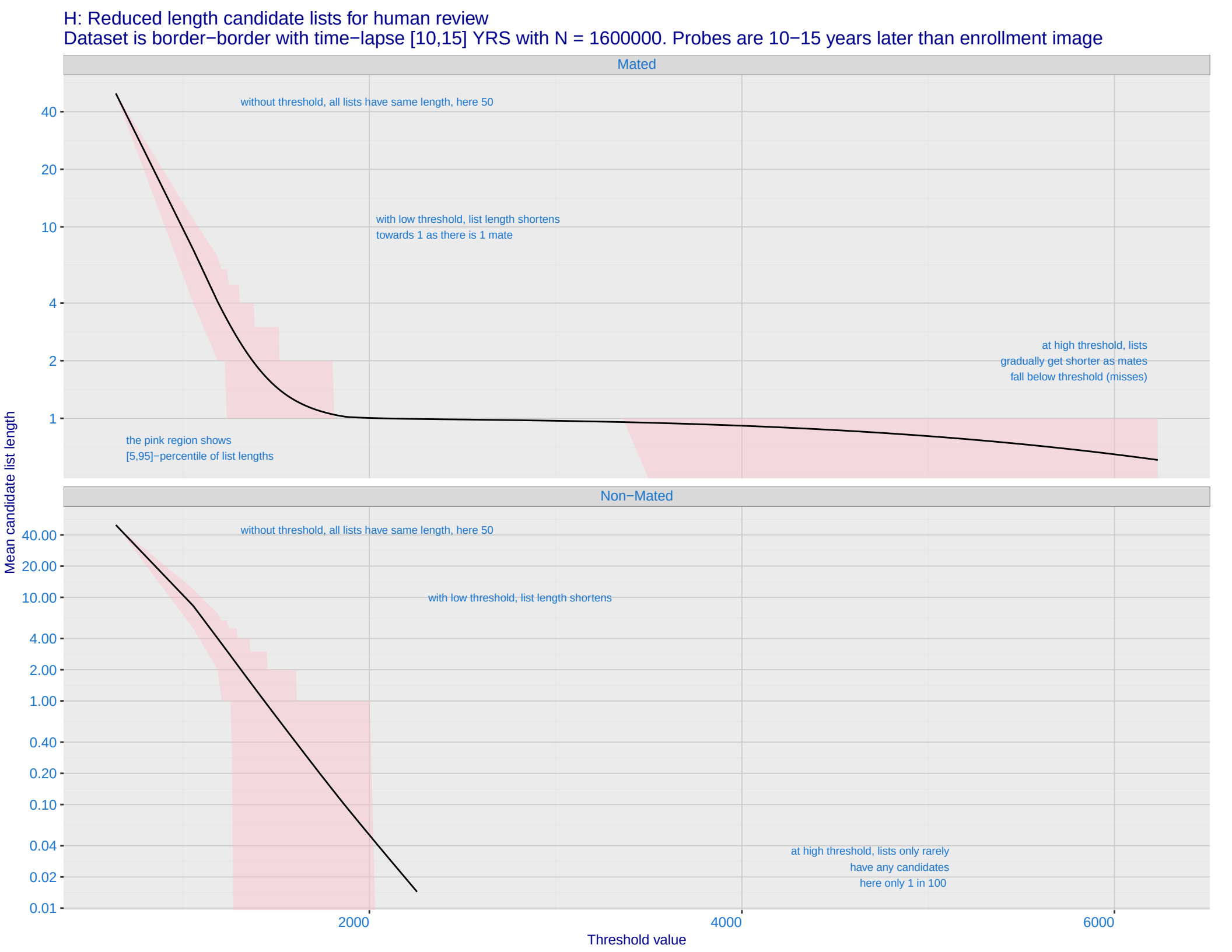

C: Evolution of accuracy for IDEMIA algorithms on three datasets 2018 − present
False negative identification rate (FNIR) at false match rate (FPIR) = 0.010000
1.000
0.800
0.600
0.500
0.400
0.300
0.200
0.100
0.080
0.060
0.050
0.040
0.030
0.020
0.010
0.008
0.006
0.005
0.004
0.003
0.002
2018
2019
2020
2021
2022
Date algorithm submitted to FRVT
Dataset
Mugshot−Mugshot
Mugshot−ProfileView
Mugshot−Webcam
Visa−Border
Visa−Kiosk

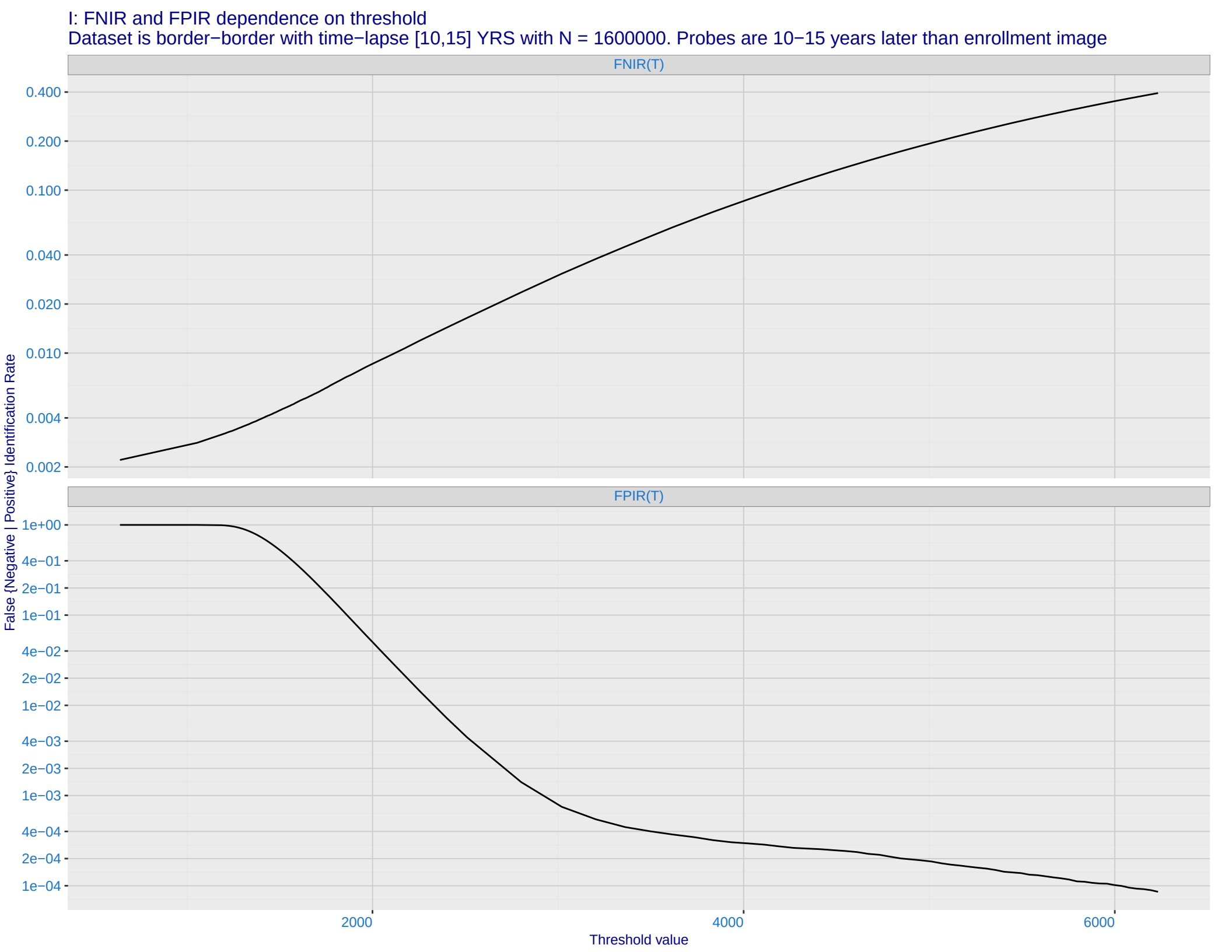

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
idemia 009
nec 005
False negative identification rate, FNIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
3e−04
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

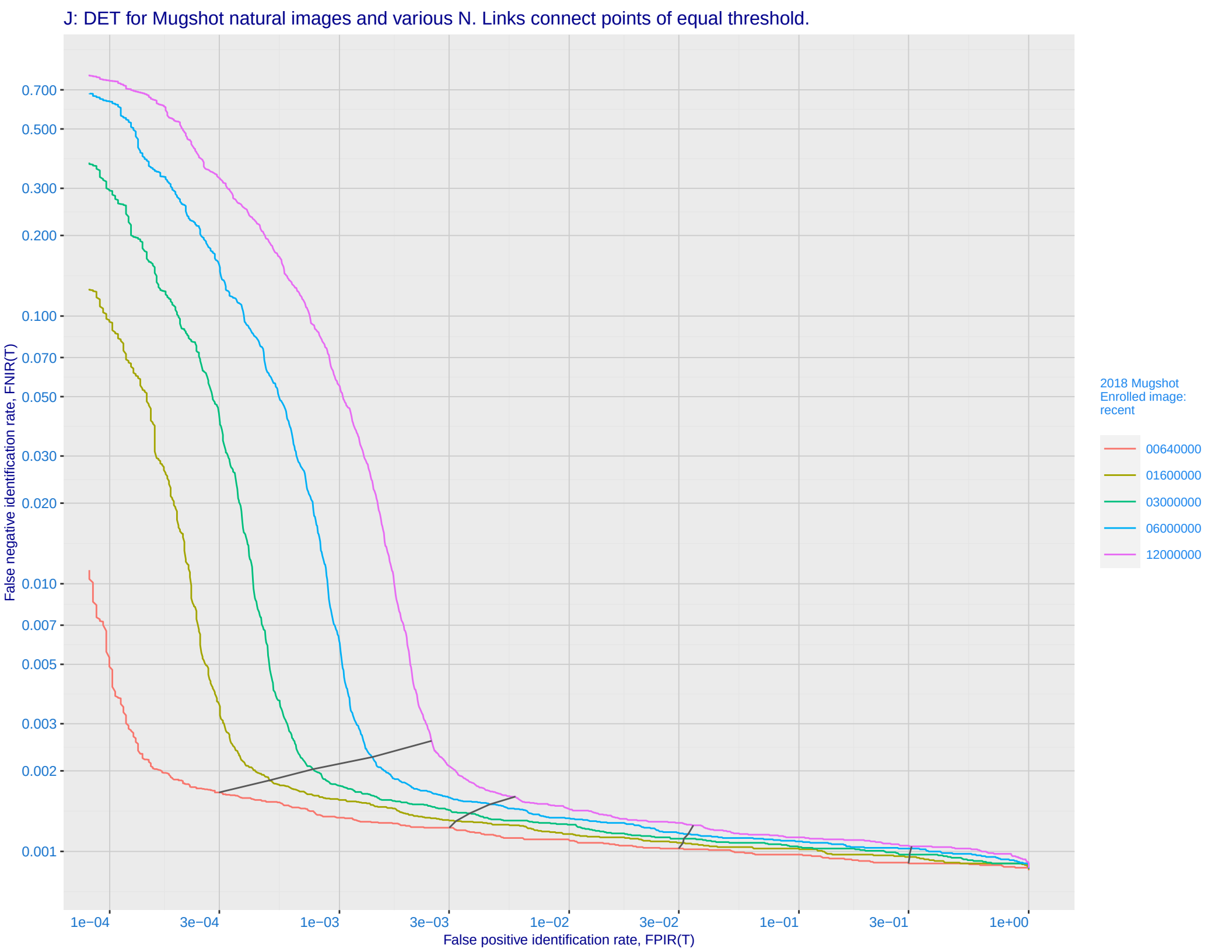

E: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images
N
00640000
01600000
03000000
06000000
12000000
recent
FNIR
FPIR
Identification Error rate, FPIR(T) or FNIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
2500
5000
7500
10000
12500
Threshold

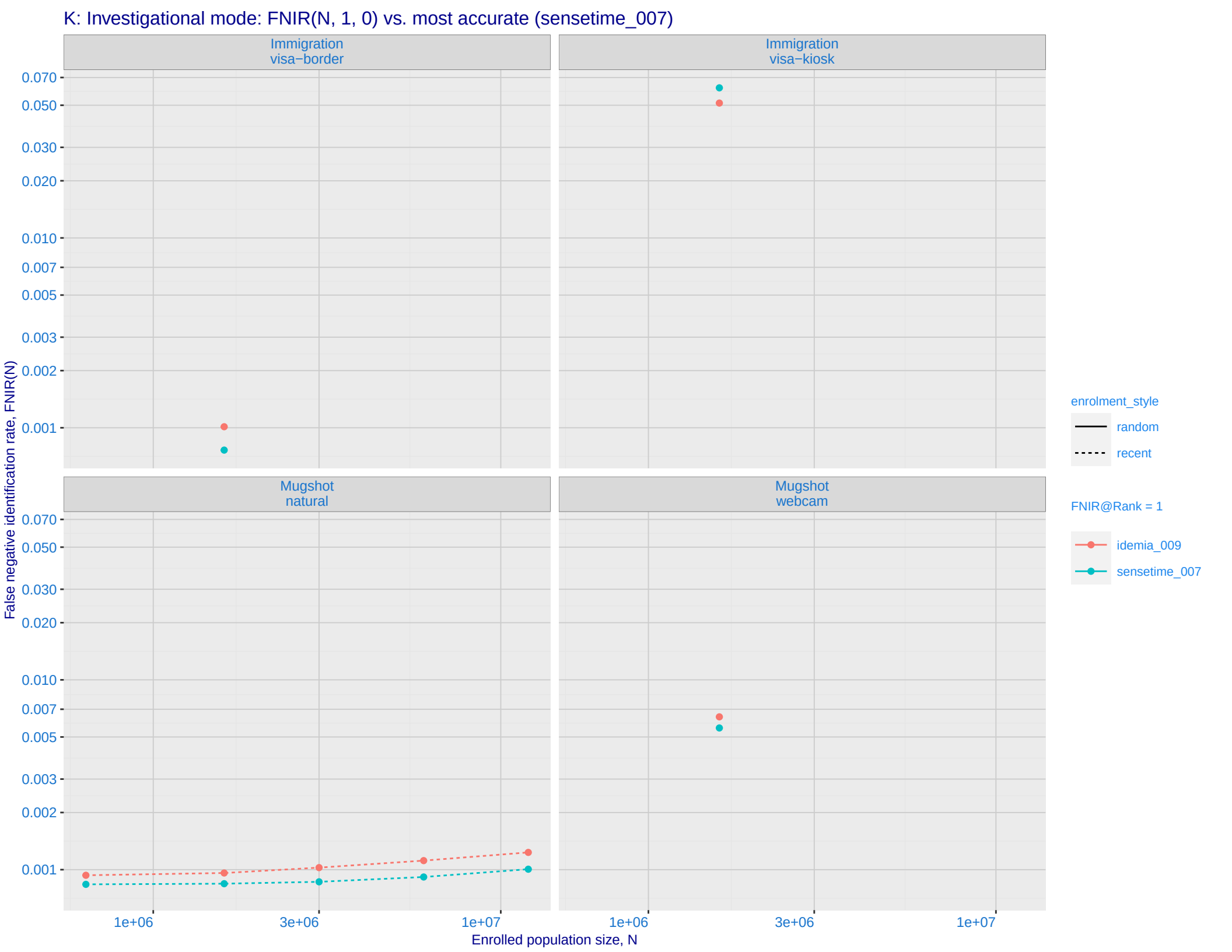

F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate
Selectivity, SEL(T)
7e+01
5e+01
3e+01
2e+01
1e+01
7e+00
5e+00
3e+00
2e+00
1e+00
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05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

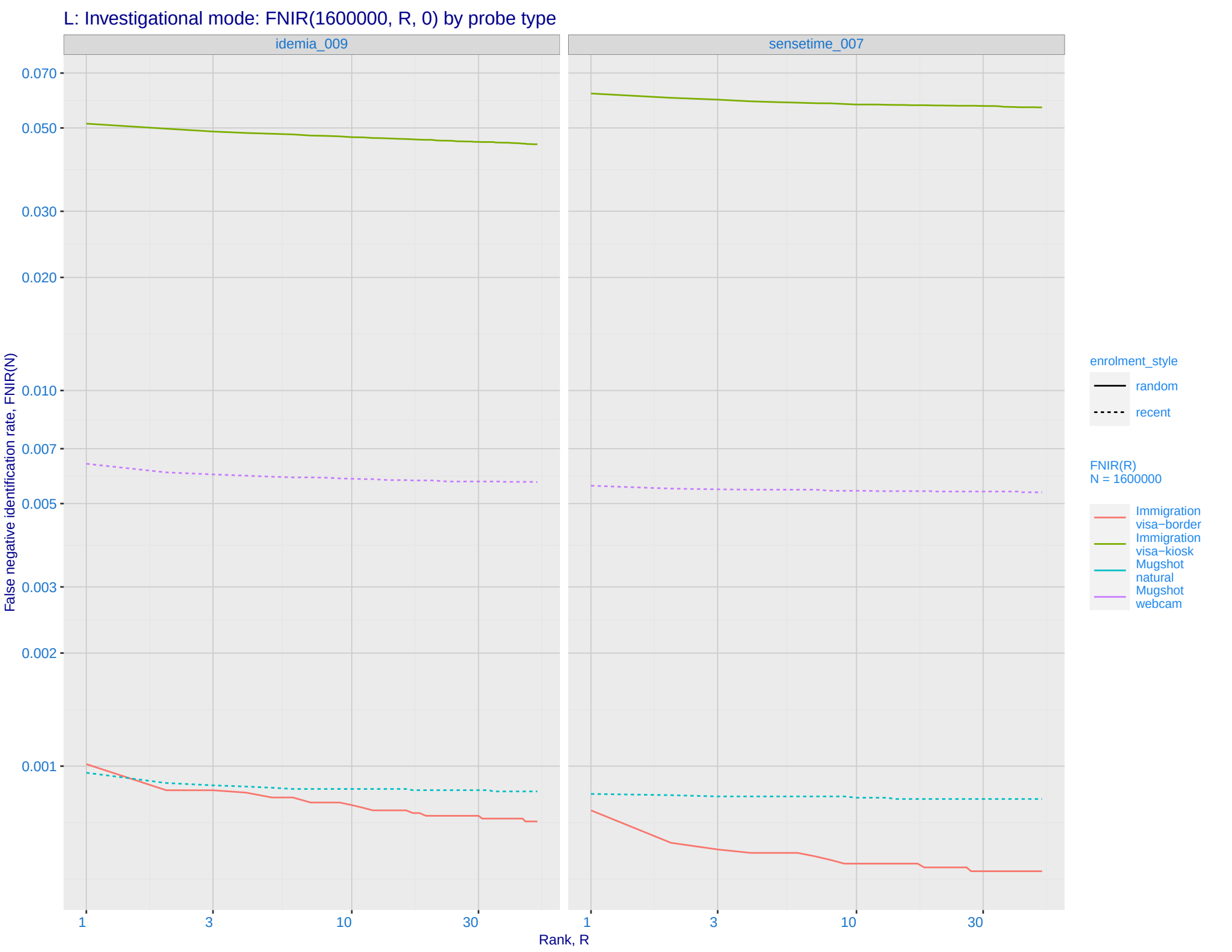

G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Idenification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
2000
4000
6000
8000
Threshold
Enrolled image:
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
40
20
10
4
2
1
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.20
0.10
0.04
0.02
0.01
2000
4000
6000

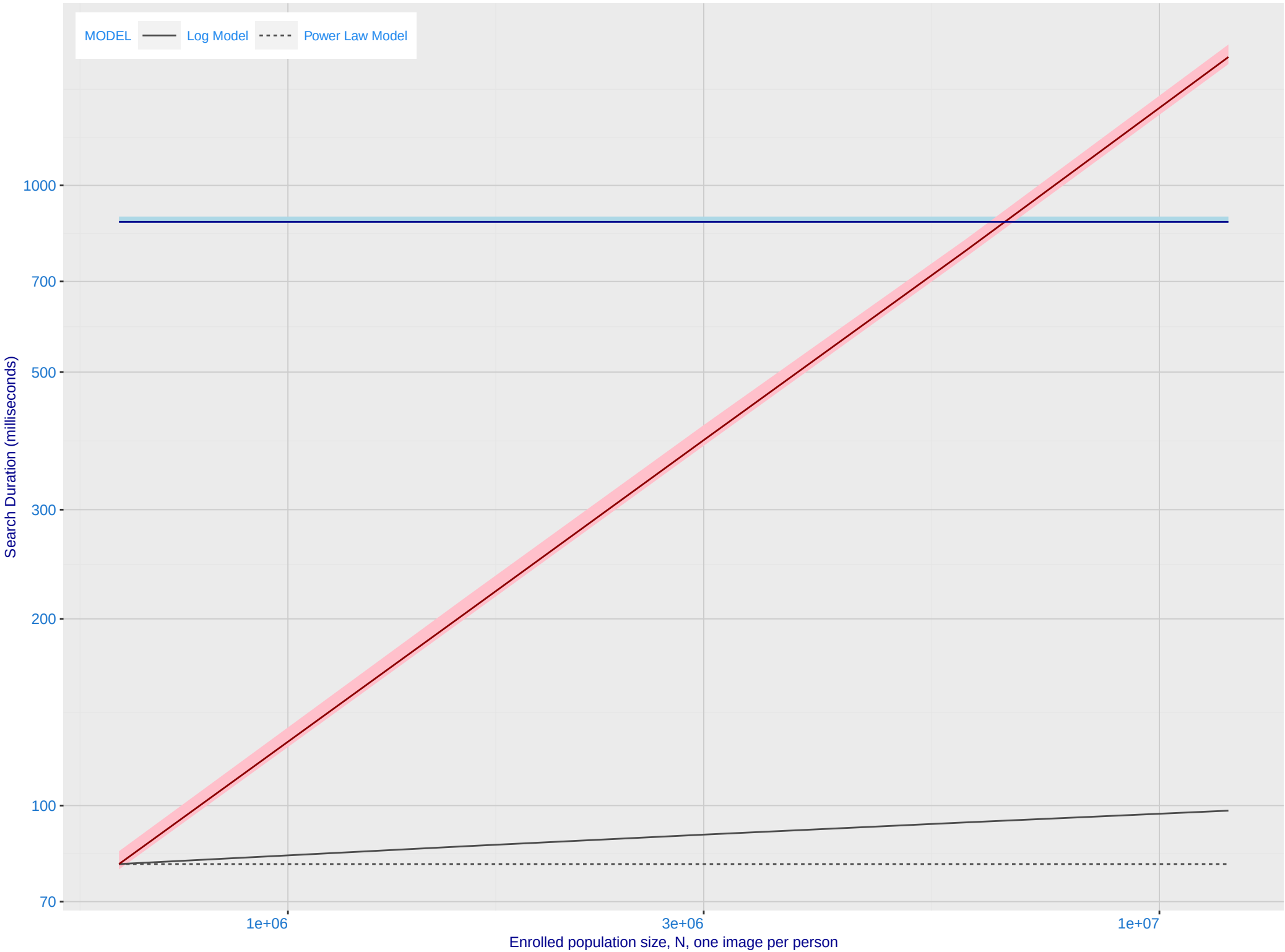

I: FNIR and FPIR dependence on threshold
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
FNIR(T)
0.400
0.200
0.100
0.040
0.020
0.010
0.004
0.002
FPIR(T)
1e+00
4e−01
2e−01
1e−01
4e−02
2e−02
1e−02
4e−03
2e−03
1e−03
4e−04
2e−04
1e−04
False {Negative | Positive} Identification Rate
2000
4000
6000
Threshold value

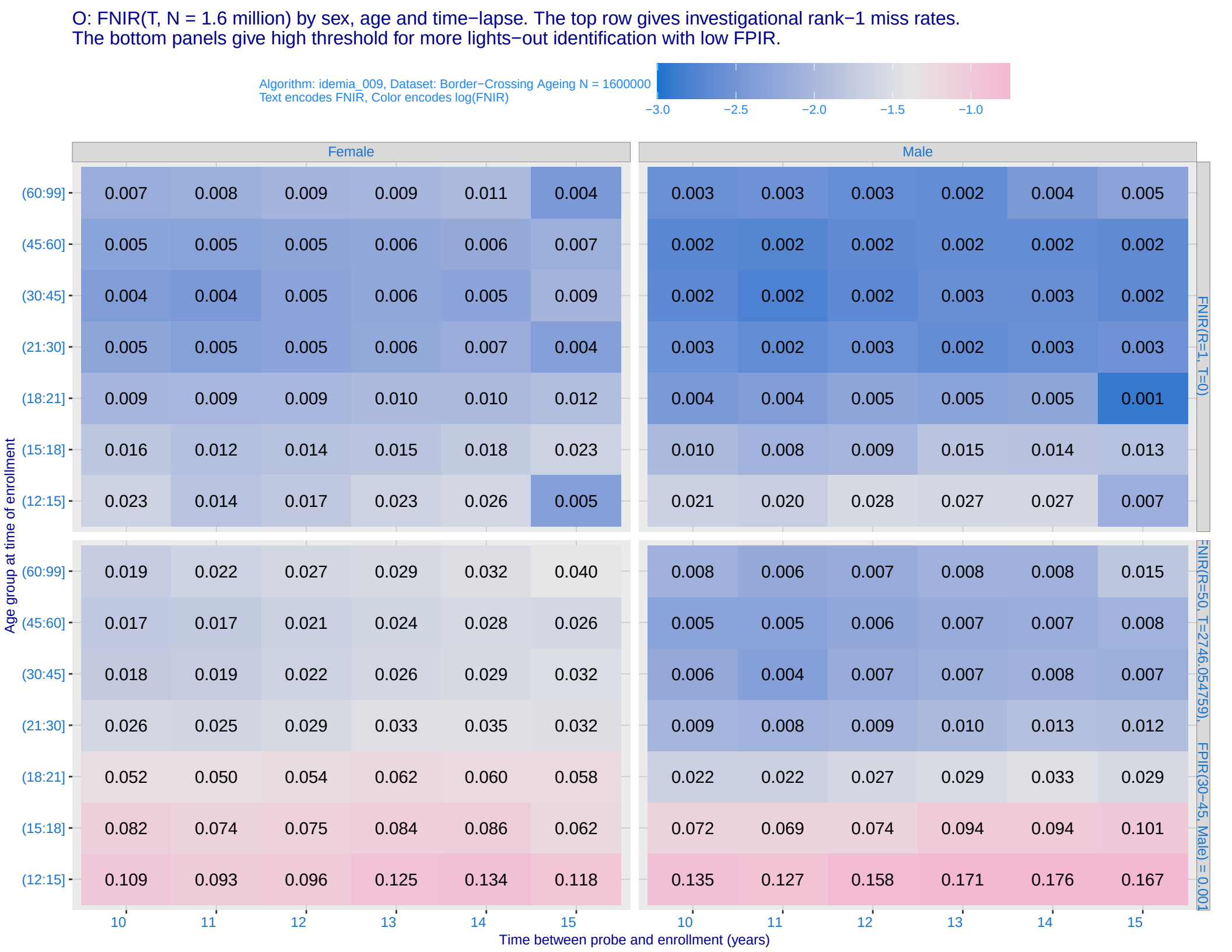

J: DET for Mugshot natural images and various N. Links connect points of equal threshold.
False negative identification rate, FNIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
1e+00
False positive identification rate, FPIR(T)
2018 Mugshot
Enrolled image:
recent
00640000
01600000
03000000
06000000
12000000


K: Investigational mode: FNIR(N, 1, 0) vs. most accurate (sensetime_007)
Immigration
visa−border
Immigration
visa−kiosk
Mugshot
natural
Mugshot
webcam
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
False negative identification rate, FNIR(N)
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
random
recent
FNIR@Rank = 1
idemia_009
sensetime_007

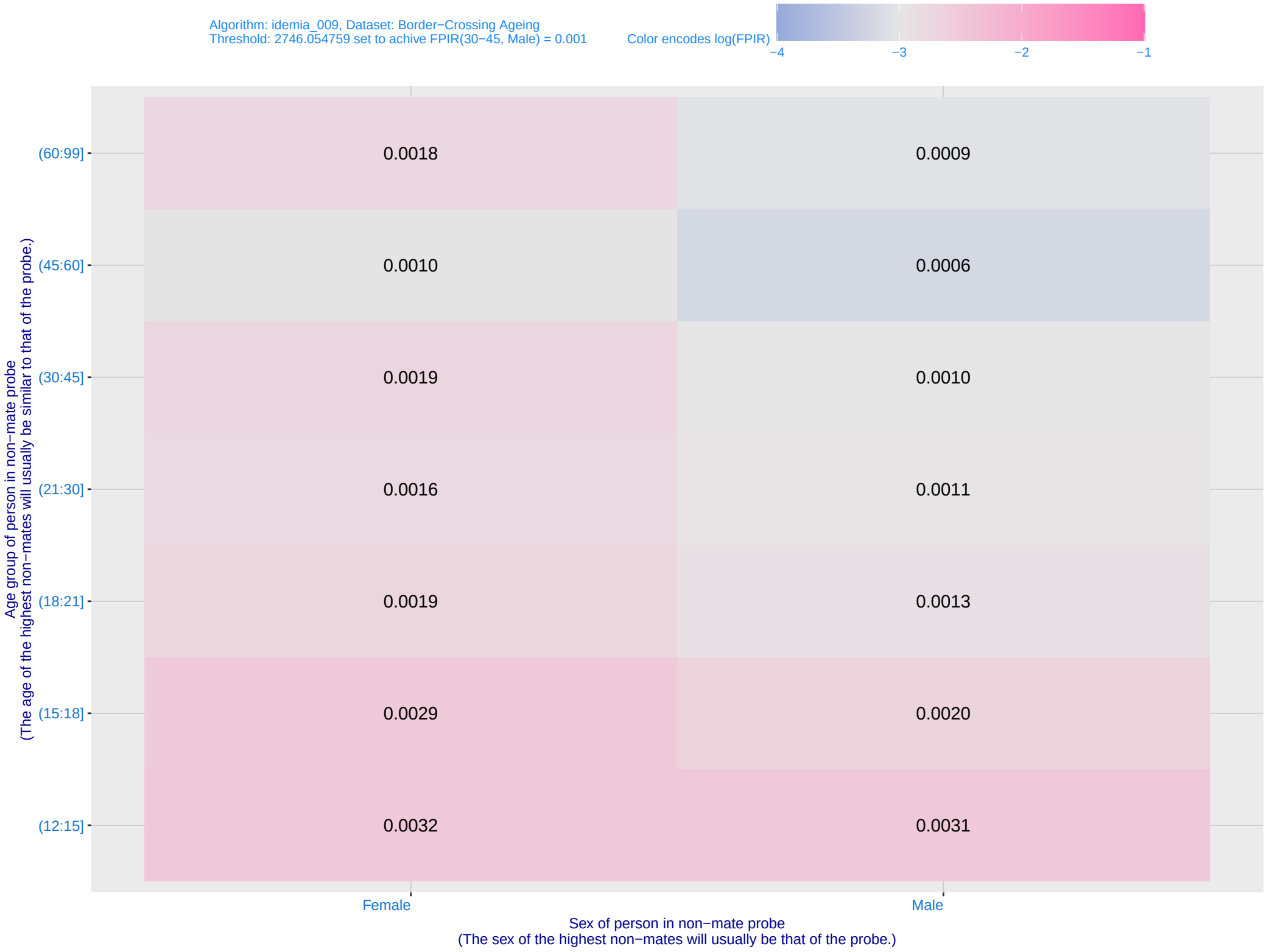

L: Investigational mode: FNIR(1600000, R, 0) by probe type
idemia_009
sensetime_007
False negative identification rate, FNIR(N)
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1
3
10
30
Rank, R
enrolment_style
random
recent
FNIR(R)
N = 1600000
Immigration visa−border
Immigration visa−kiosk
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

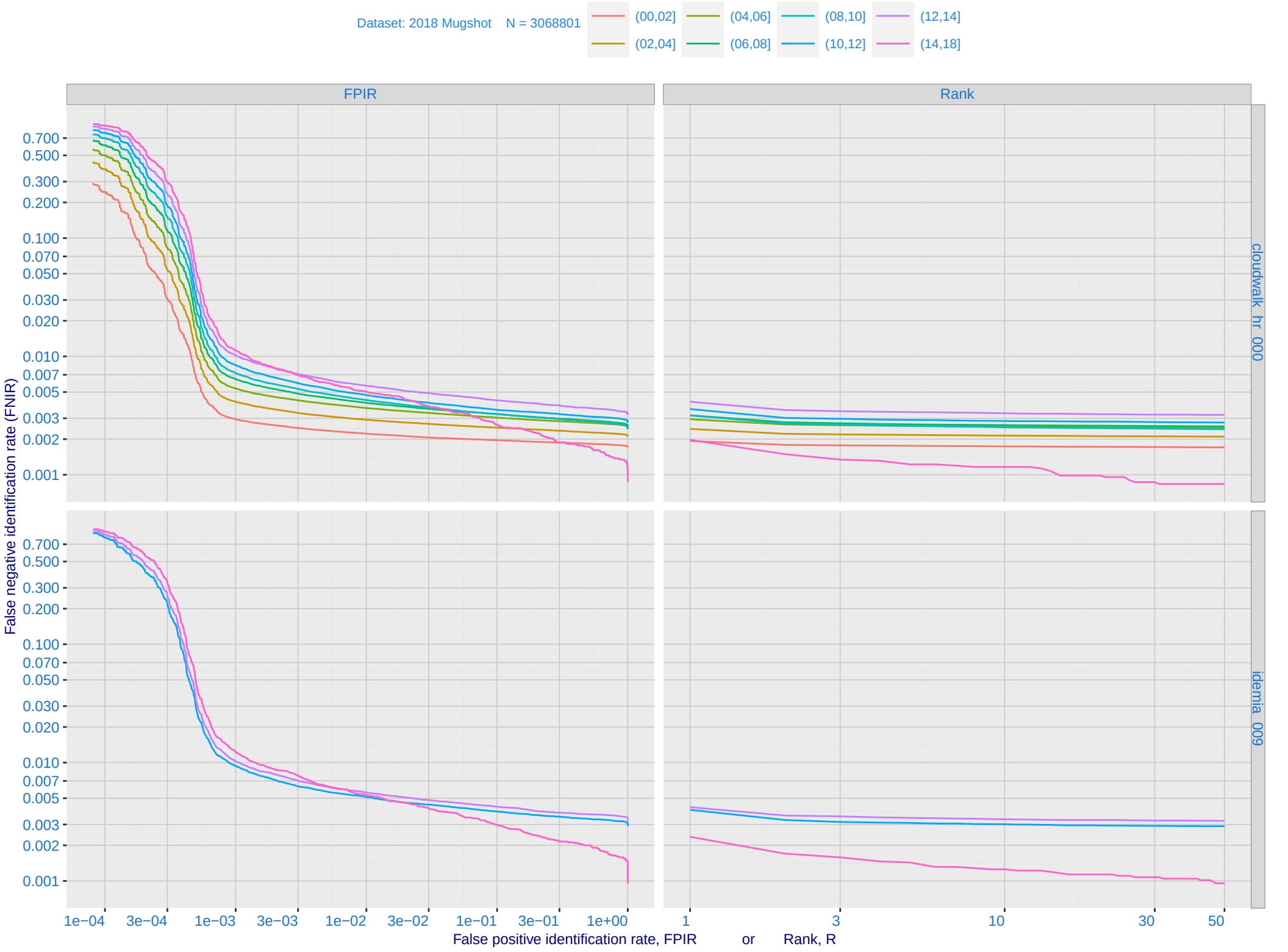


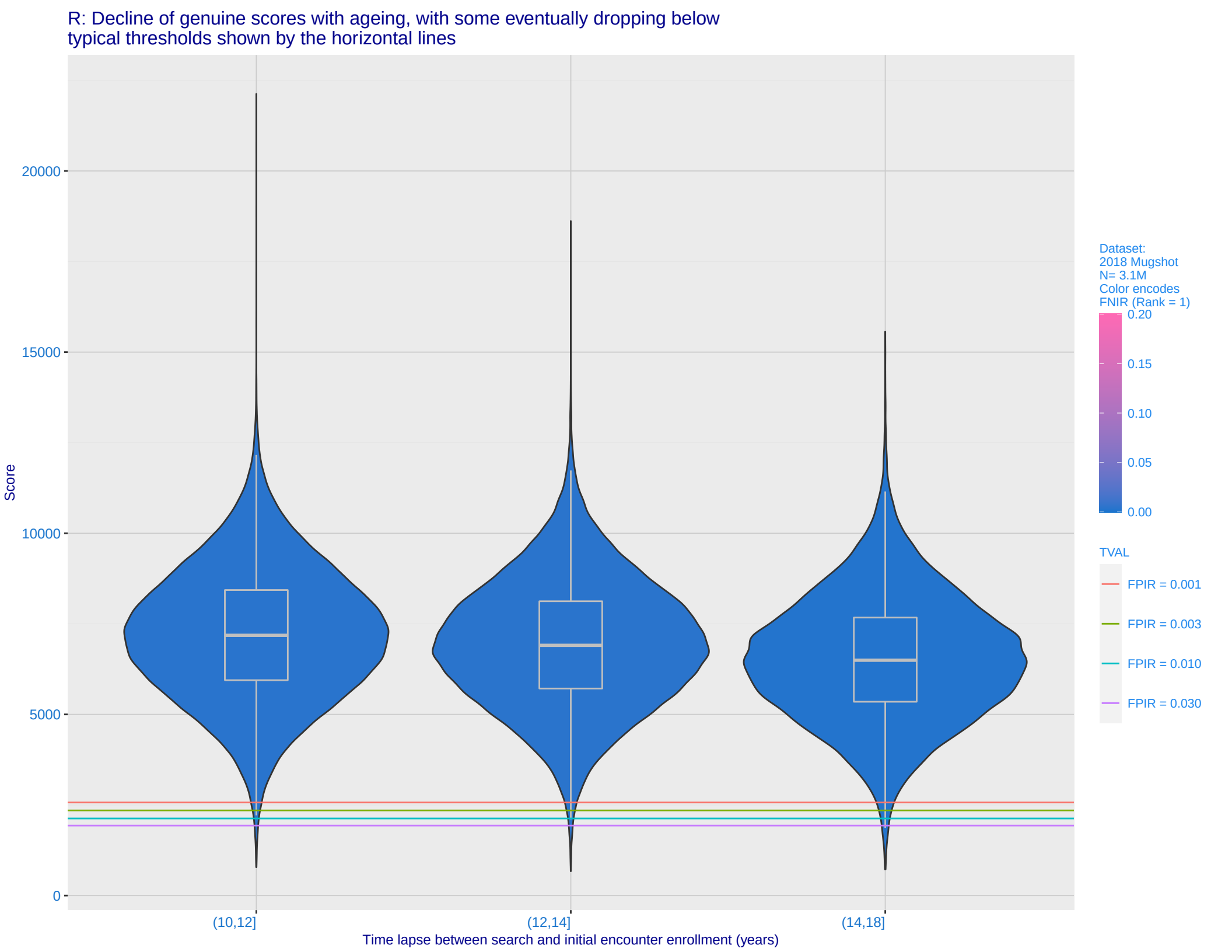

O: FNIR(T, N = 1.6 million) by sex, age and time−lapse. The top row gives investigational rank−1 miss rates.
The bottom panels give high threshold for more lights−out identification with low FPIR.
Algorithm: idemia_009, Dataset: Border−Crossing Ageing N = 1600000
Text encodes FNIR, Color encodes log(FNIR)
−3.0
−2.5
−2.0
−1.5
−1.0
Female
Male
FNIR(R=1, T=0)
FNIR(R=50, T=2746.054759), FPIR(30−45, Male) = 0.001
Age group at time of enrollment
(60:99]
(45:60]
(30:45]
(21:30]
(18:21]
(15:18]
(12:15]
0.007 0.008 0.009 0.009 0.011 0.004
0.005 0.005 0.005 0.006 0.006 0.007
0.004 0.004 0.005 0.006 0.005 0.009
0.005 0.005 0.005 0.006 0.007 0.004
0.009 0.009 0.009 0.010 0.010 0.012
0.016 0.012 0.014 0.015 0.018 0.023
0.023 0.014 0.017 0.023 0.026 0.005
0.003 0.003 0.003 0.002 0.004 0.005
0.002 0.002 0.002 0.002 0.002 0.002
0.002 0.002 0.002 0.003 0.003 0.002
0.003 0.002 0.003 0.002 0.003 0.003
0.004 0.004 0.005 0.005 0.005 0.001
0.010 0.008 0.009 0.015 0.014 0.013
0.021 0.020 0.028 0.027 0.027 0.007
0.019 0.022 0.027 0.029 0.032 0.040
0.017 0.017 0.021 0.024 0.028 0.026
0.018 0.019 0.022 0.026 0.029 0.032
0.026 0.025 0.029 0.033 0.035 0.032
0.052 0.050 0.054 0.062 0.060 0.058
0.082 0.074 0.075 0.084 0.086 0.062
0.109 0.093 0.096 0.125 0.134 0.118
0.008 0.006 0.007 0.008 0.008 0.015
0.005 0.005 0.006 0.007 0.007 0.008
0.006 0.004 0.007 0.007 0.008 0.007
0.009 0.008 0.009 0.010 0.013 0.012
0.022 0.022 0.027 0.029 0.033 0.029
0.072 0.069 0.074 0.094 0.094 0.101
0.135 0.127 0.158 0.171 0.176 0.167
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




R: Decline of genuine scores with ageing, with some eventually dropping below typical thresholds shown by the horizontal lines
Score
20000
15000
10000
5000
0
(10,12]
(12,14]
(14,18]
Time lapse between search and initial encounter enrollment (years)
Dataset:
2018 Mugshot
N= 3.1M
Color encodes
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