A: Datasheet

Algorithm: cogent_007

Developer: Thales Group

Submission Date: 2023_01_30

Template size: 550 bytes

Template time (2.5 percentile): 983 msec

Template time (median): 984 msec

Template time (97.5 percentile): 1034 msec

Investigation:

Frontal mugshot ranking 24 (out of 402) −− FNIR(1600000, 0, 1) = 0.0011 vs. lowest 0.0008 from intema_001

Mugshot webcam ranking 39 (out of 364) −− FNIR(1600000, 0, 1) = 0.0081 vs. lowest 0.0054 from sensetime_009

Mugshot profile ranking 26 (out of 333) −− FNIR(1600000, 0, 1) = 0.0640 vs. lowest 0.0517 from sensetime_009

Immigration visa−border ranking 27 (out of 291) −− FNIR(1600000, 0, 1) = 0.0012 vs. lowest 0.0006 from cloudwalk_mt_002

Immigration visa−kiosk ranking 112 (out of 236) −− FNIR(1600000, 0, 1) = 0.0903 vs. lowest 0.0387 from cloudwalk_mt_002

Identification:

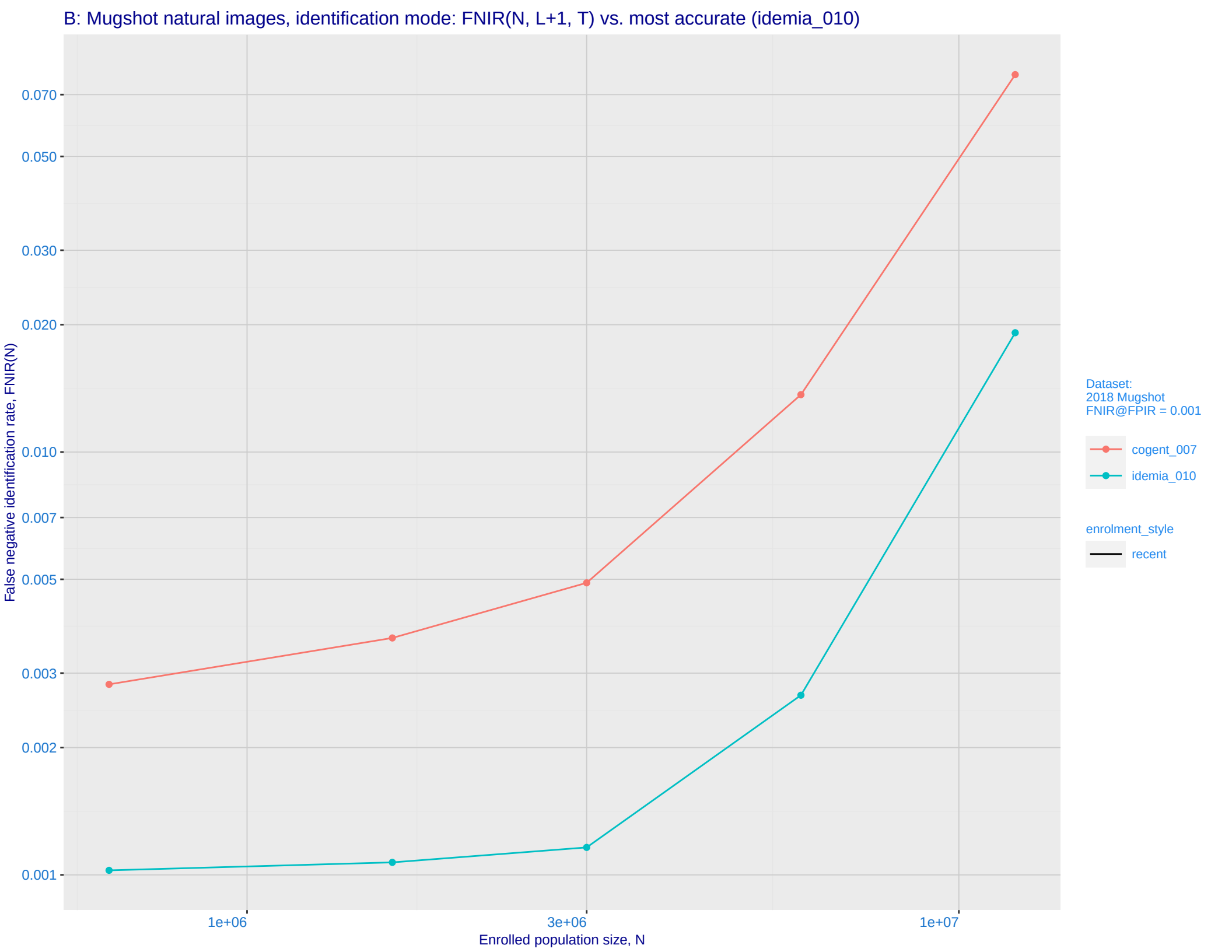
Frontal mugshot ranking 34 (out of 402) −− FNIR(1600000, T, L+1) = 0.0036, FPIR=0.001000 vs. lowest 0.0011 from idemia_010

Mugshot webcam ranking 34 (out of 362) −− FNIR(1600000, T, L+1) = 0.0213, FPIR=0.001000 vs. lowest 0.0072 from sensetime_009

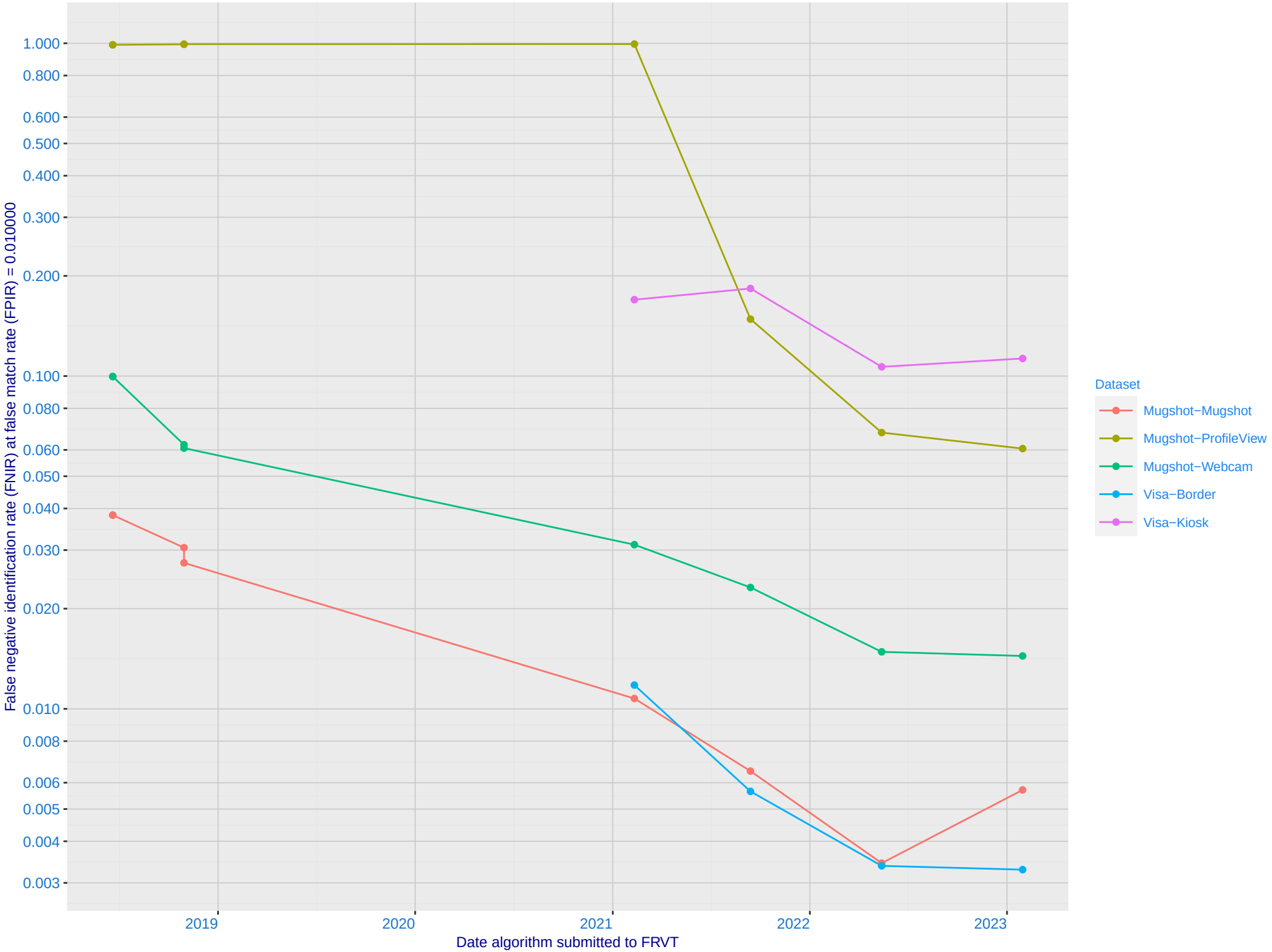
Mugshot profile ranking 13 (out of 332) −− FNIR(1600000, T, L+1) = 0.1940, FPIR=0.001000 vs. lowest 0.0634 from cloudwalk_mt_002

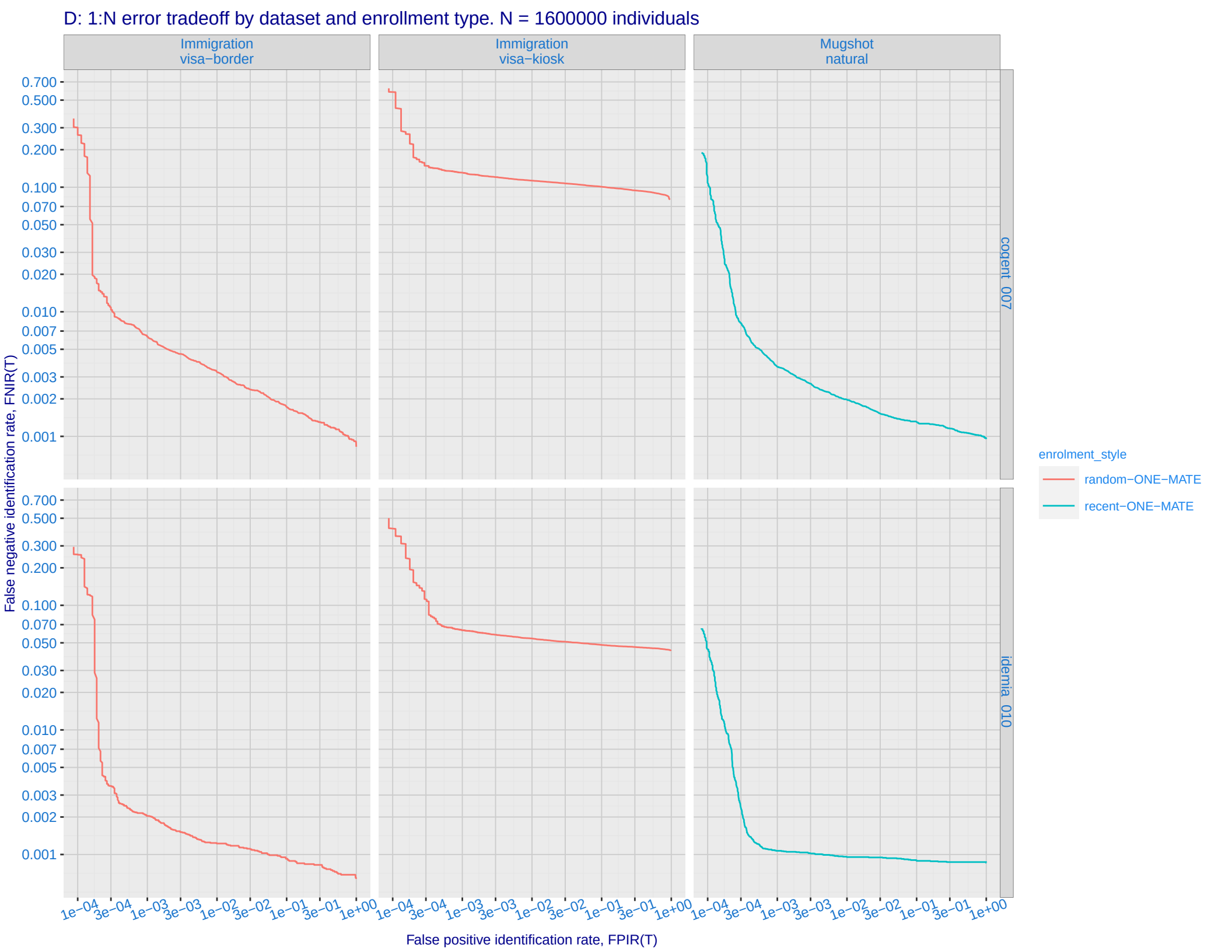
Immigration visa−border ranking 30 (out of 290) −− FNIR(1600000, T, L+1) = 0.0063, FPIR=0.001000 vs. lowest 0.0010 from cloudwalk_mt_002

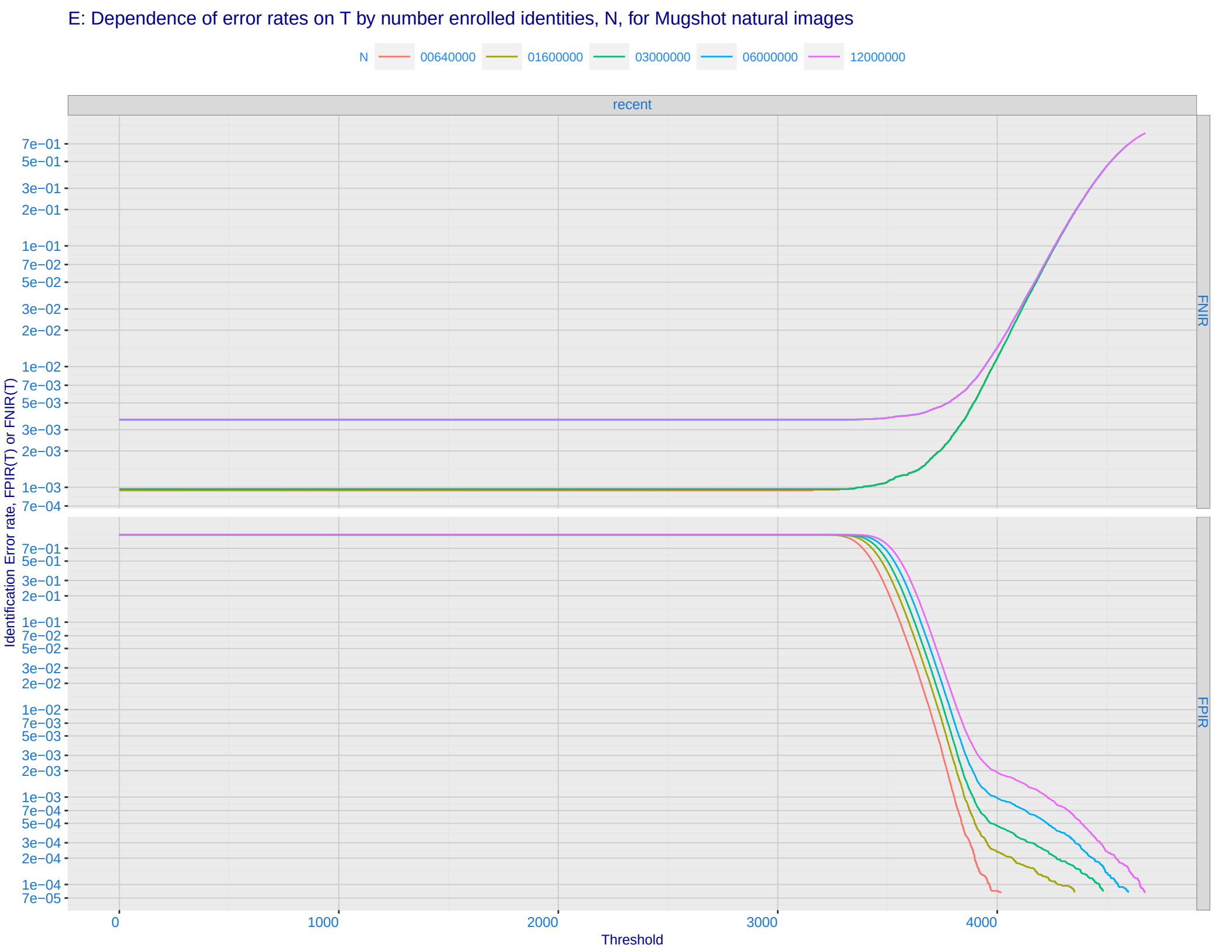
Immigration visa−kiosk ranking 54 (out of 236) −− FNIR(1600000, T, L+1) = 0.1309, FPIR=0.001000 vs. lowest 0.0517 from cloudwalk_mt_002

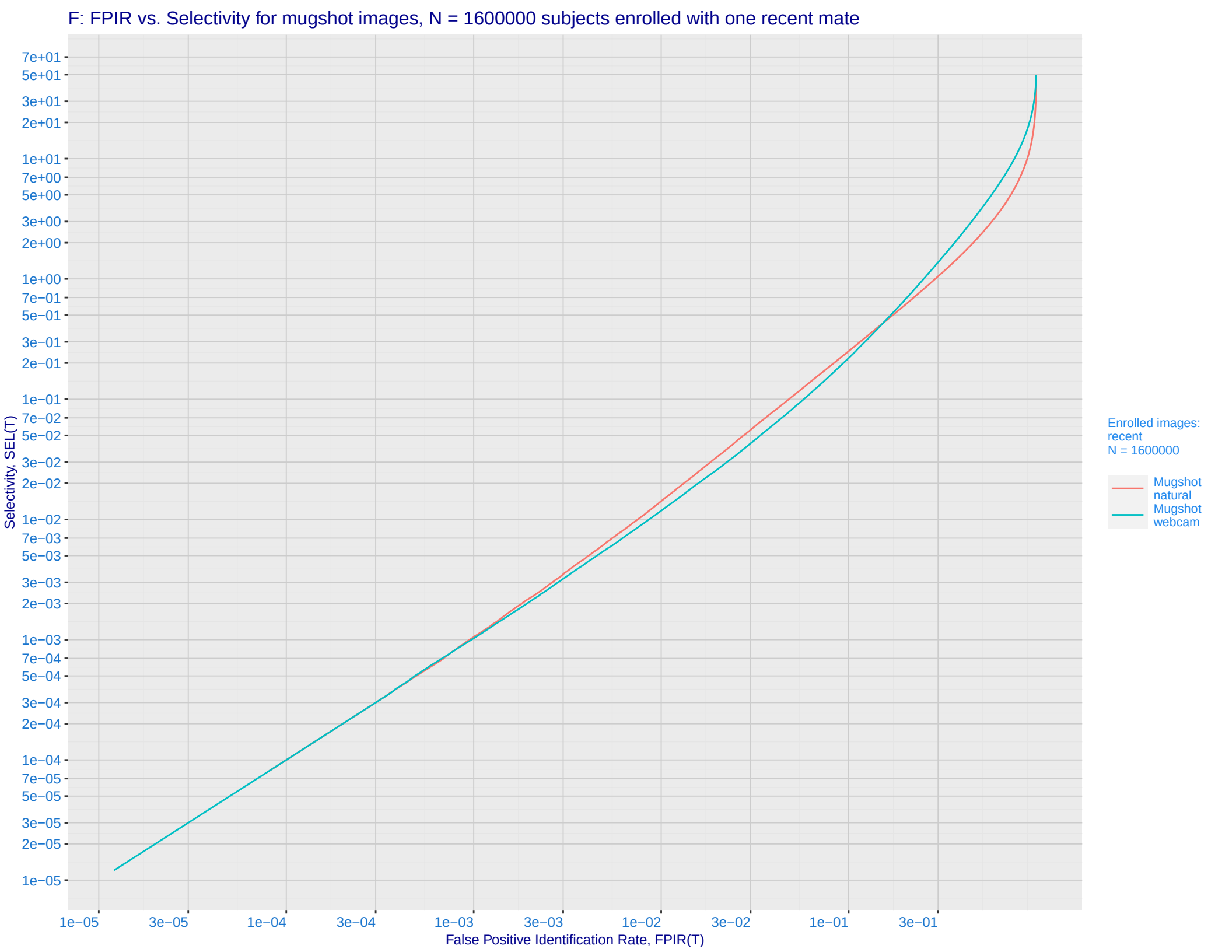

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (idemia_010)
False negative identification rate, FNIR(N)
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e+06
3e+06
1e+07
Enrolled population size, N
Dataset:
2018 Mugshot
FNIR@FPIR = 0.001
cogent_007
idemia_010
enrolment_style
recent

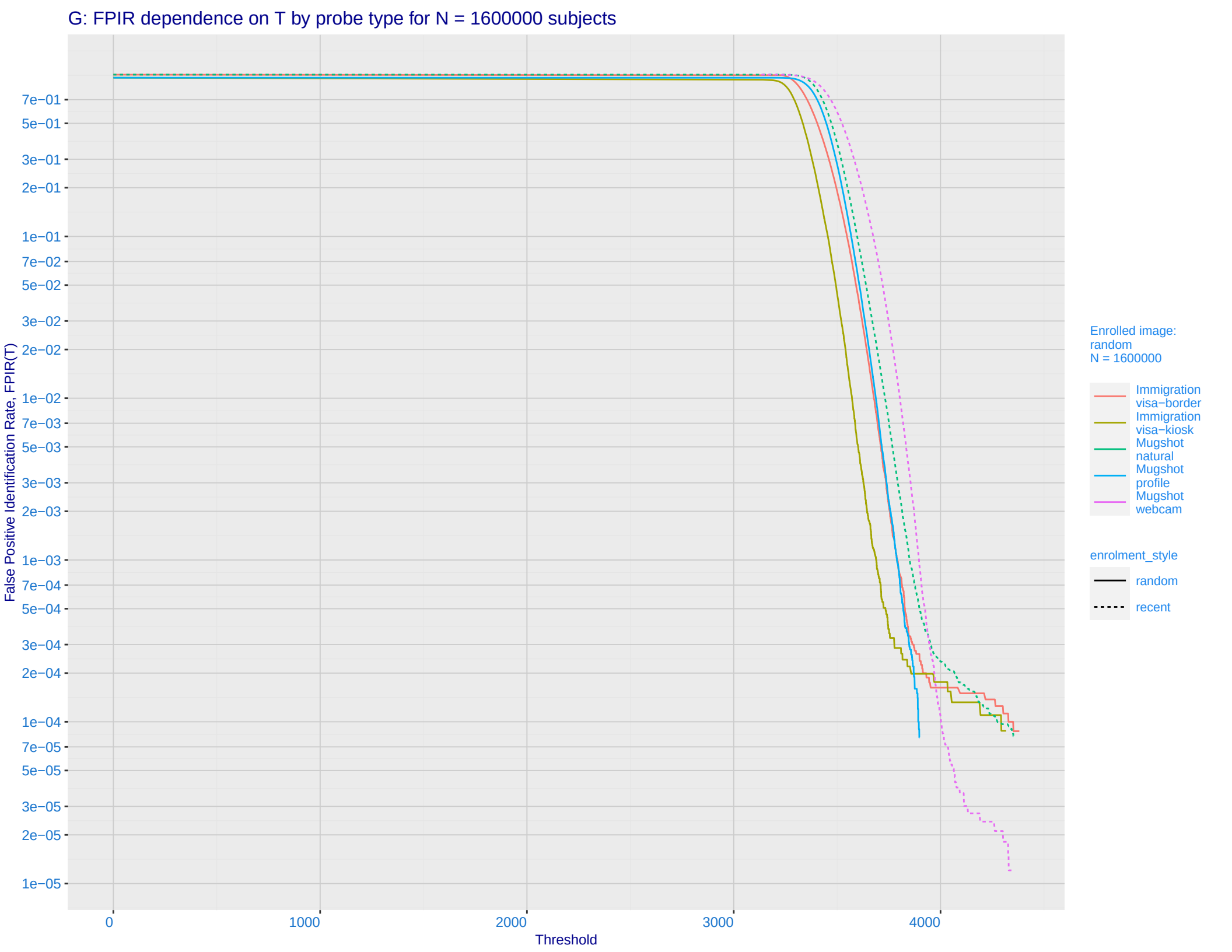
C: Evolution of accuracy for COGENT algorithms on three datasets 2018 − present

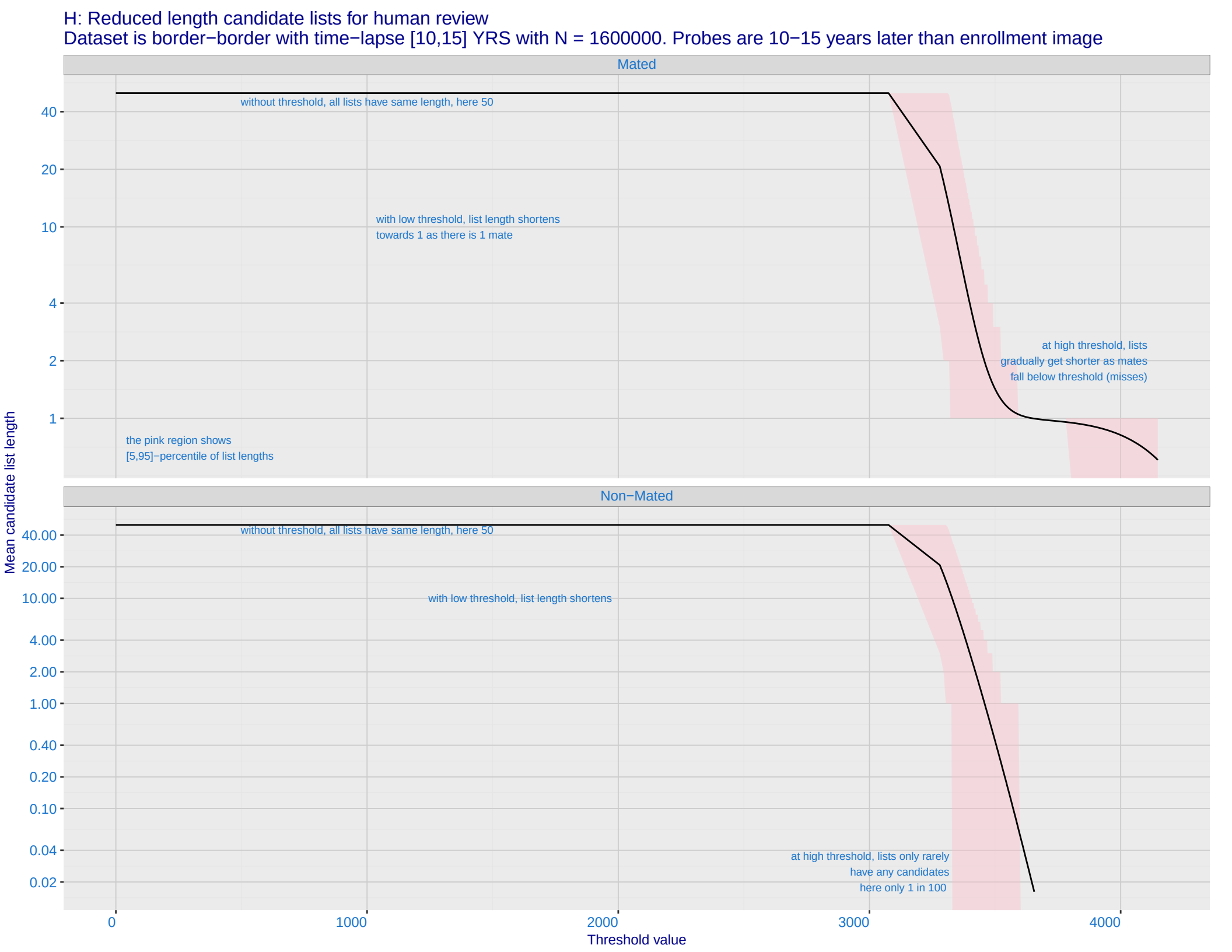


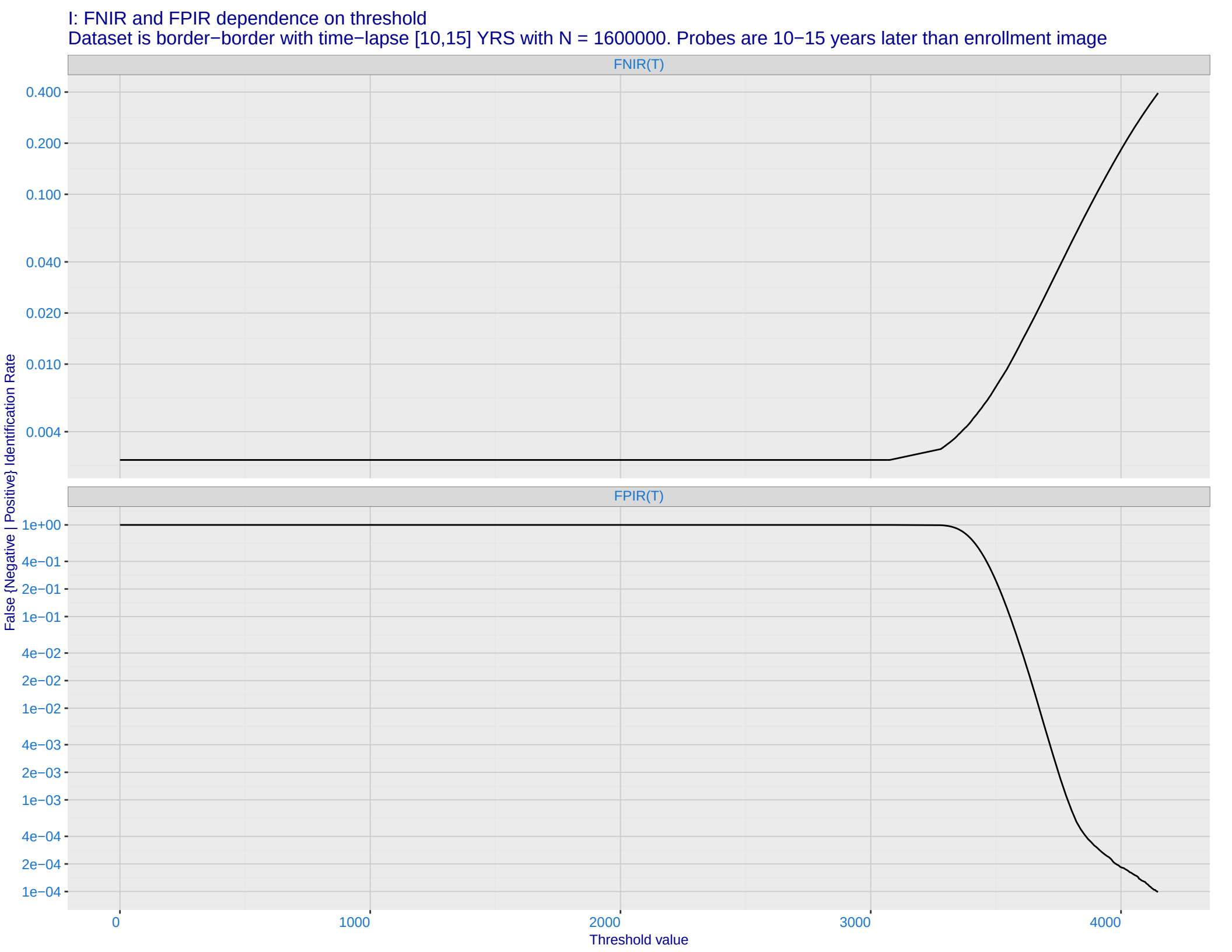

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
cogent 007
idemia 010
False negative identification rate, FNIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
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

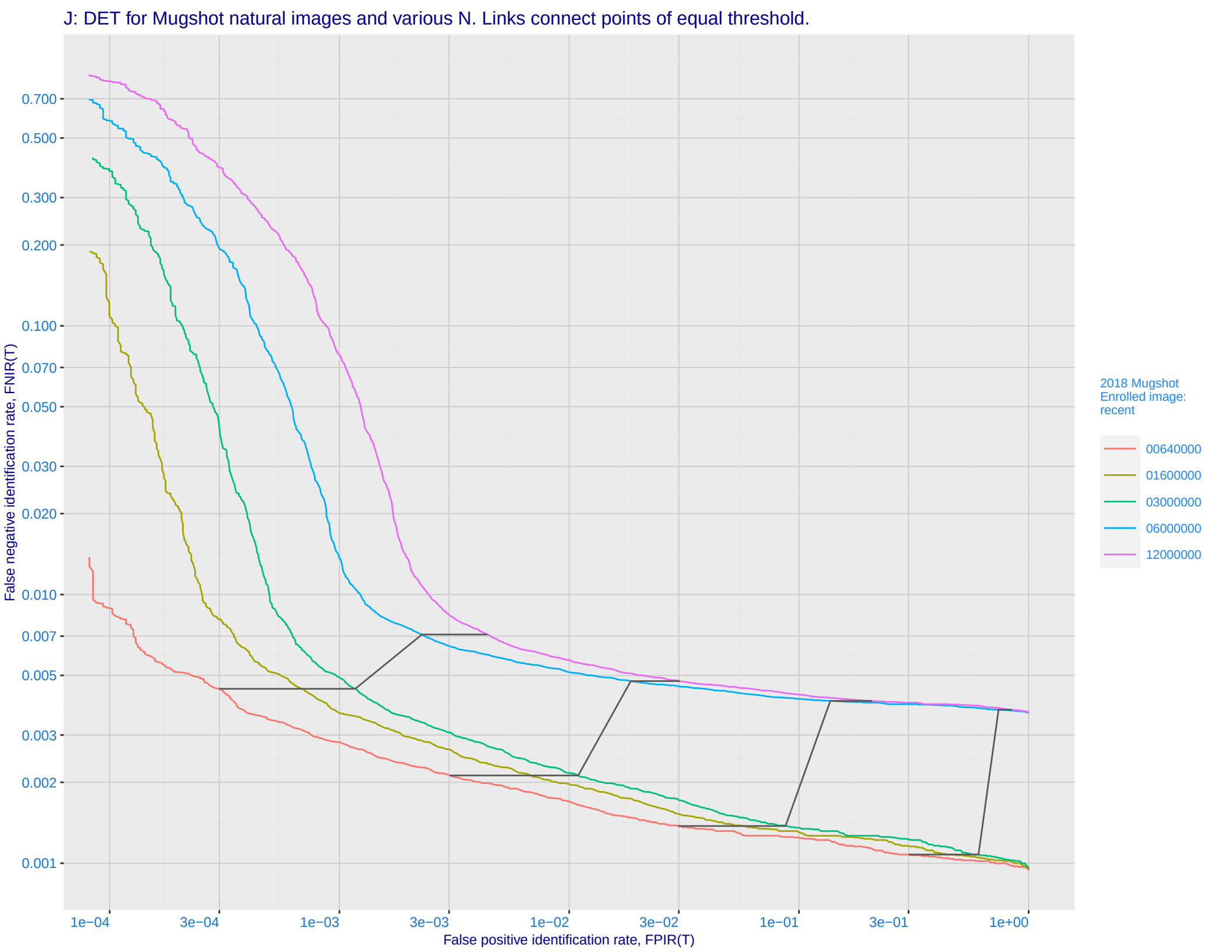

E: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images
N
00640000
01600000
03000000
06000000
12000000
recent
FNIR
FPIR
Identification Error rate, FPIR(T) or FNIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
0
1000
2000
3000
4000
Threshold

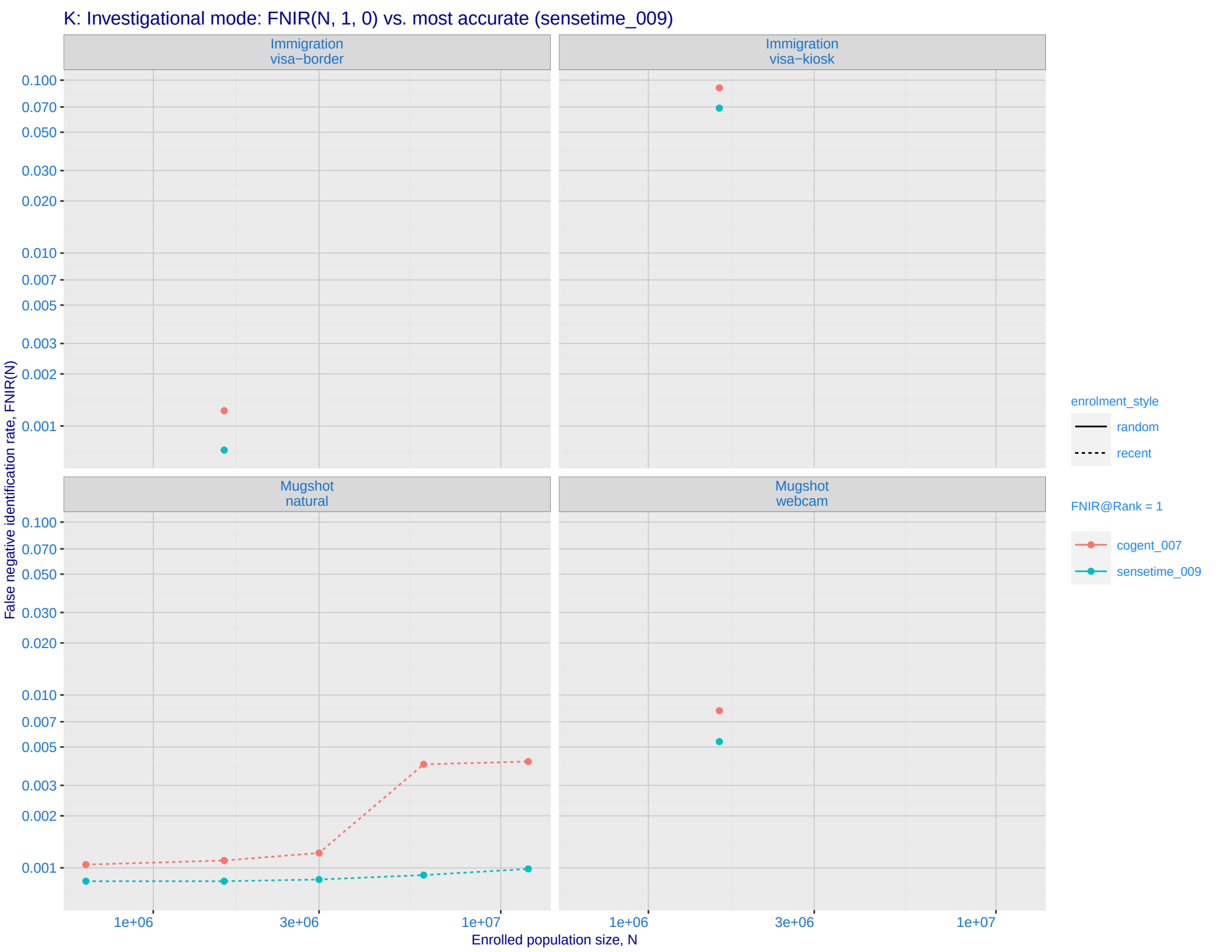

F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate
Selectivity, SEL(T)
7e+01
5e+01
3e+01
2e+01
1e+01
7e+00
5e+00
3e+00
2e+00
1e+00
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05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

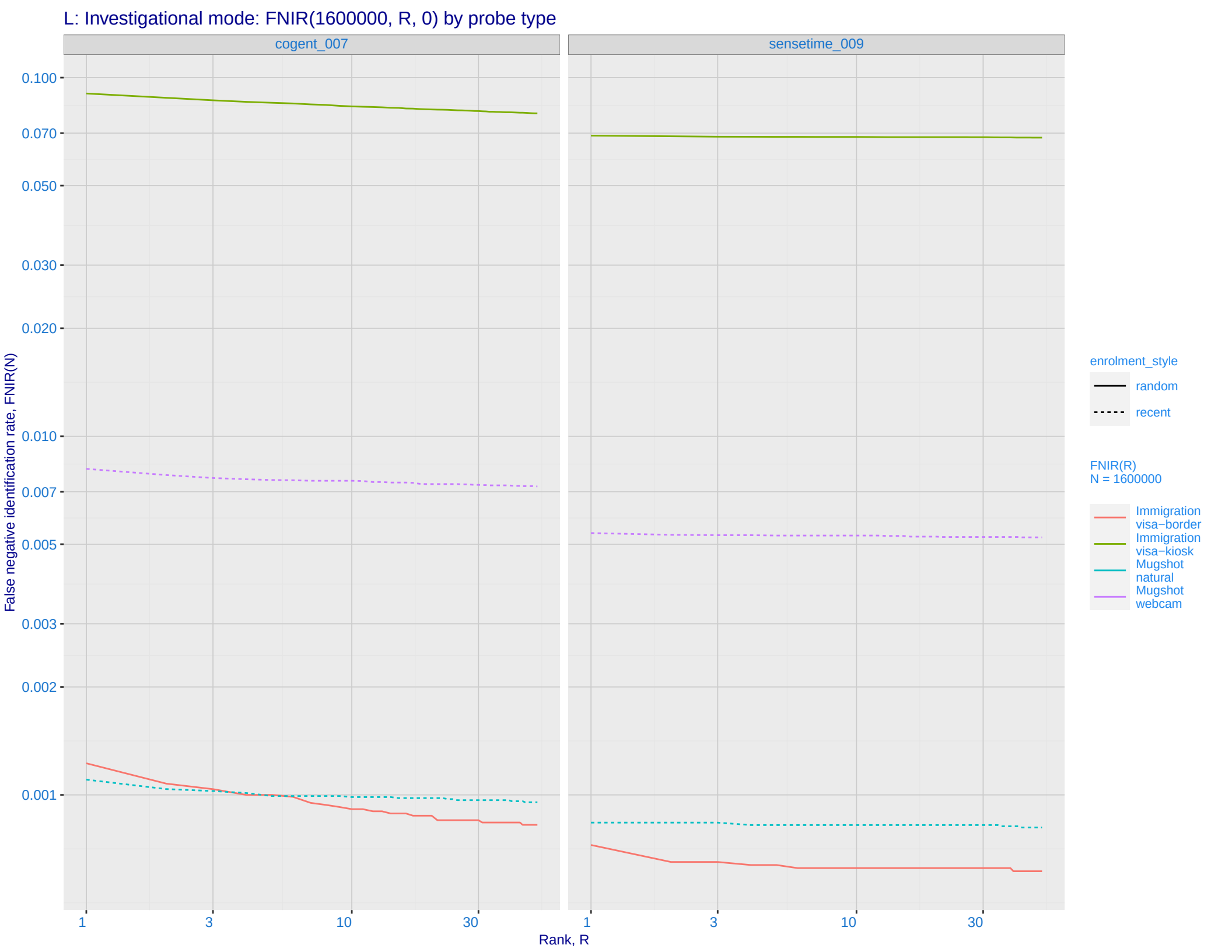

G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Identification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
0
1000
2000
3000
4000
Threshold
Enrolled image:
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
1000
2000
3000
4000

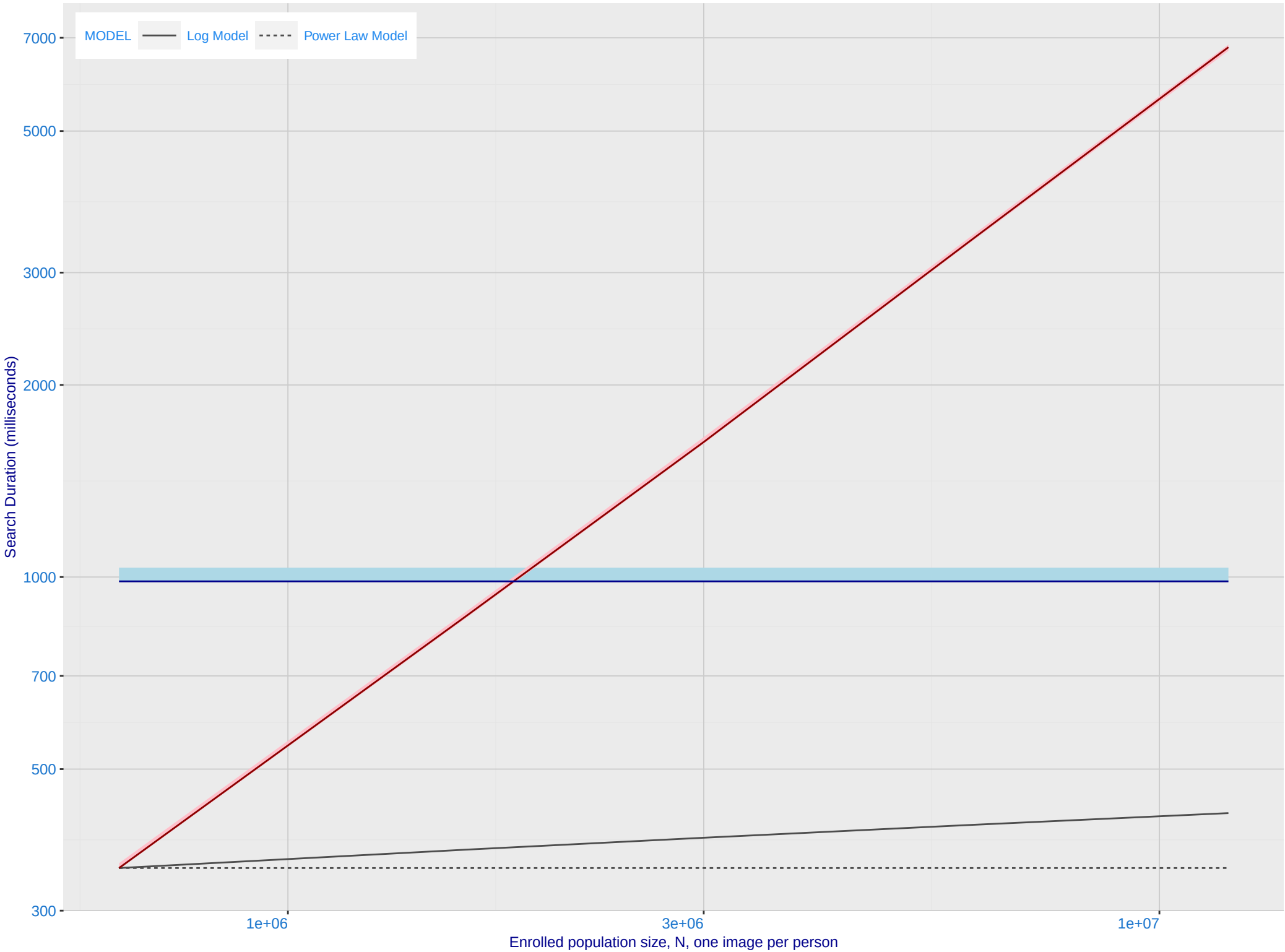

I: FNIR and FPIR dependence on threshold
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
FNIR(T)
0.400
0.200
0.100
0.040
0.020
0.010
0.004
FPIR(T)
1e+00
4e−01
2e−01
1e−01
4e−02
2e−02
1e−02
4e−03
2e−03
1e−03
4e−04
2e−04
1e−04
False {Negative | Positive} Identification Rate
0
1000
2000
3000
4000
Threshold value

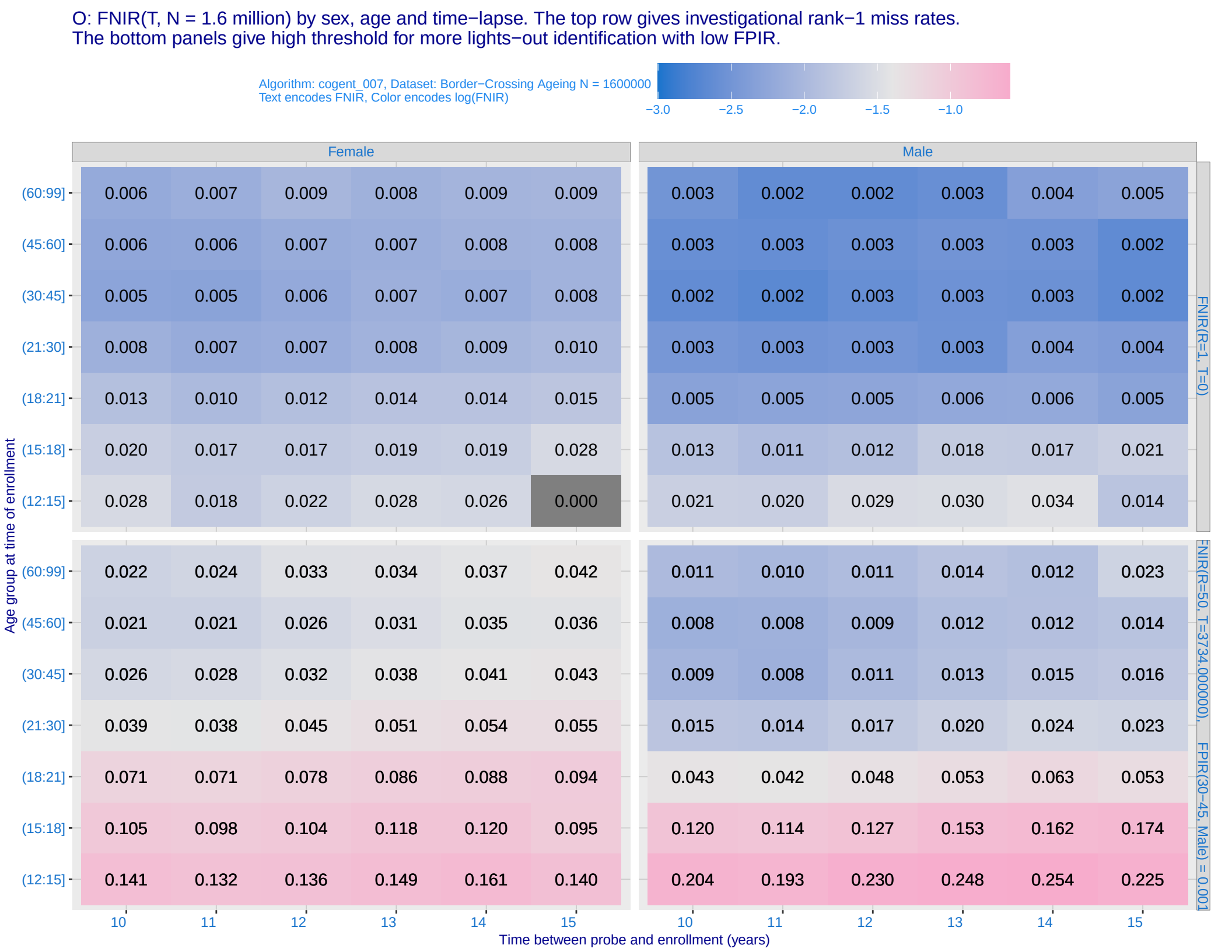

J: DET for Mugshot natural images and various N. Links connect points of equal threshold.
False negative identification rate, FNIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
1e+00
False positive identification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


K: Investigational mode: FNIR(N, 1, 0) vs. most accurate (sensetime_009)
Immigration
visa−border
Immigration
visa−kiosk
Mugshot
natural
Mugshot
webcam
0.100
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
cogent_007
sensetime_009

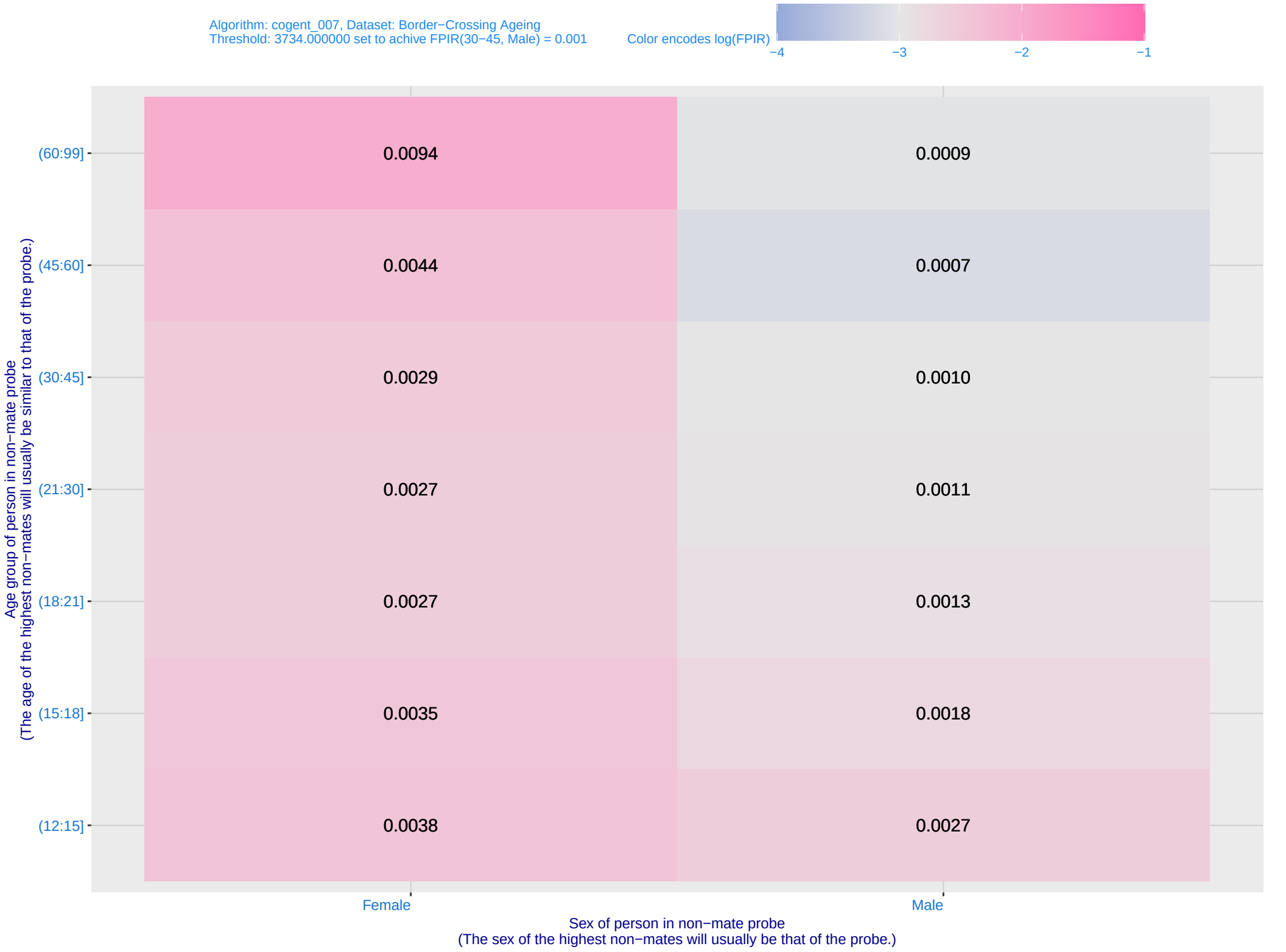

L: Investigational mode: FNIR(1600000, R, 0) by probe type
cogent_007
sensetime_009
False negative identification rate, FNIR(N)
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1
3
10
30
Rank, R
enrolment_style
random
recent
FNIR(R)
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam

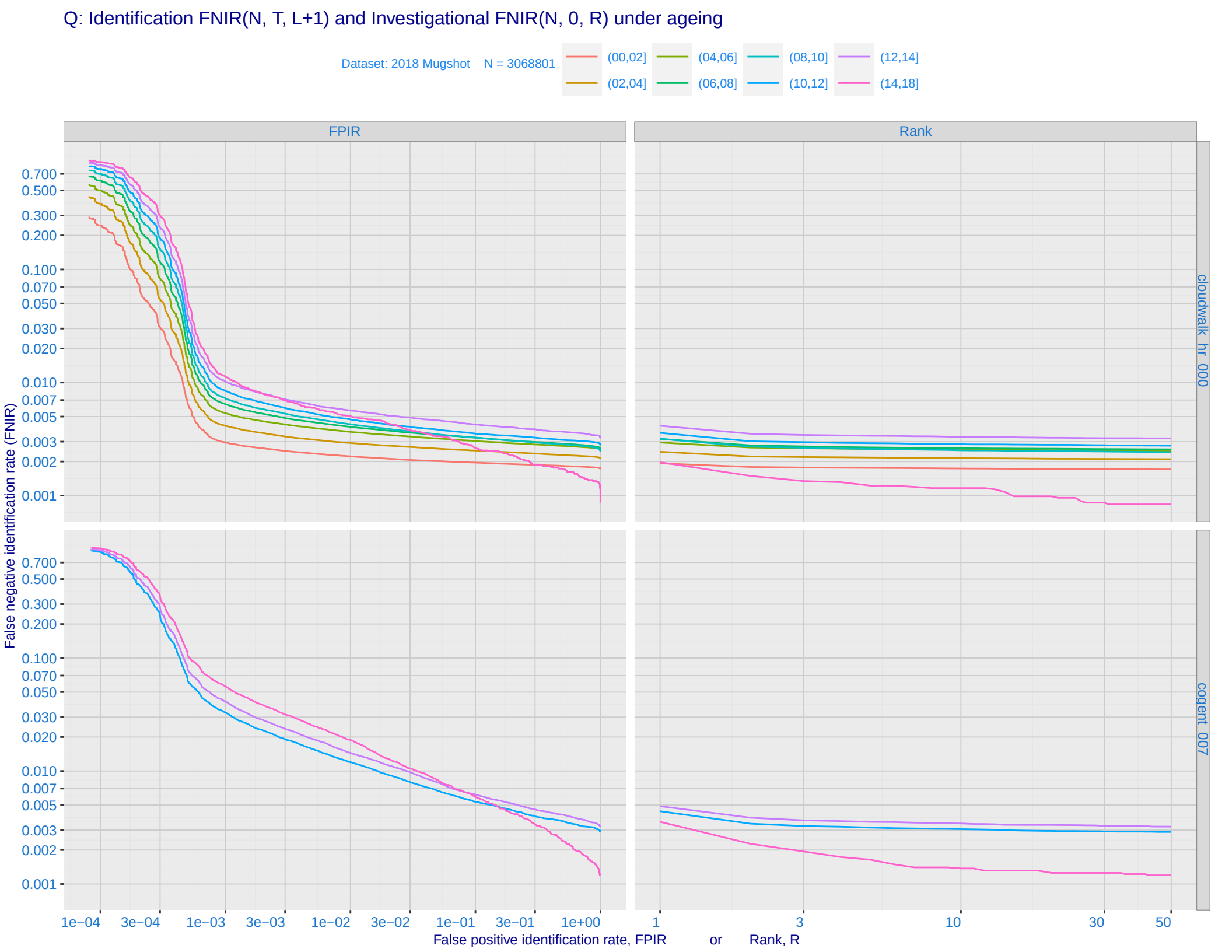
M: Template duration; search duration vs. N. The blue and pink ribbon covers 95 percent of observed measurements.
The template generation time is independent of N. The log and power−law models are fit to the first two (N,T) observations

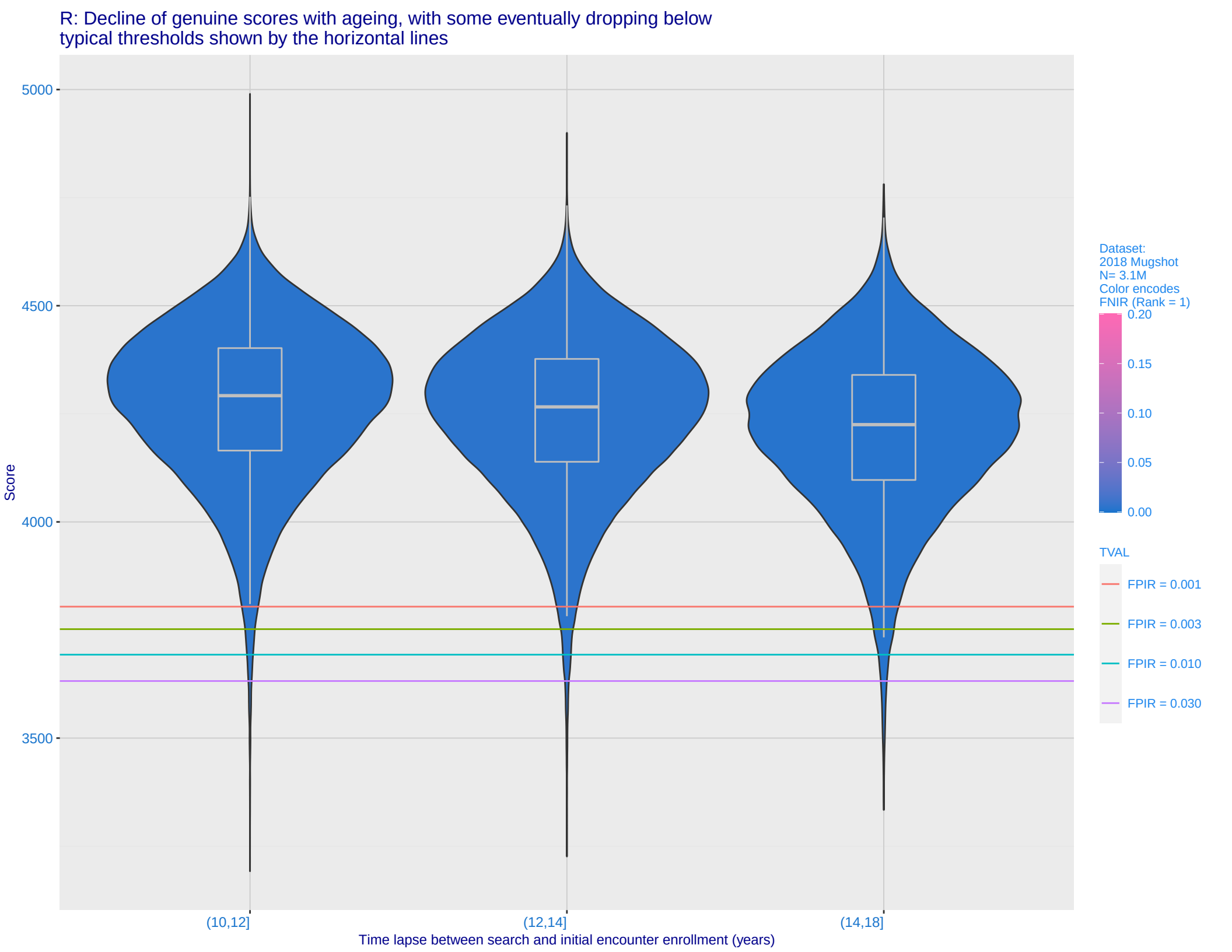



O: FNIR(T, N = 1.6 million) by sex, age and time−lapse. The top row gives investigational rank−1 miss rates.
The bottom panels give high threshold for more lights−out identification with low FPIR.
Algorithm: cogent_007, Dataset: Border−Crossing Ageing N = 1600000
Text encodes FNIR, Color encodes log(FNIR)
−3.0
−2.5
−2.0
−1.5
−1.0
Female
Male
(60:99]
(45:60]
(30:45]
(21:30]
(18:21]
(15:18]
(12:15]
0.006 0.007 0.009 0.008 0.009 0.009
0.006 0.006 0.007 0.007 0.008 0.008
0.005 0.005 0.006 0.007 0.007 0.008
0.008 0.007 0.007 0.008 0.009 0.010
0.013 0.010 0.012 0.014 0.014 0.015
0.020 0.017 0.017 0.019 0.019 0.028
0.028 0.018 0.022 0.028 0.026 0.000
0.003 0.002 0.002 0.003 0.004 0.005
0.003 0.003 0.003 0.003 0.003 0.002
0.002 0.002 0.003 0.003 0.003 0.002
0.003 0.003 0.003 0.003 0.004 0.004
0.005 0.005 0.005 0.006 0.006 0.005
0.013 0.011 0.012 0.018 0.017 0.021
0.021 0.020 0.029 0.030 0.034 0.014
FNIR(R=1, T=0)
0.022 0.024 0.033 0.034 0.037 0.042
0.021 0.021 0.026 0.031 0.035 0.036
0.026 0.028 0.032 0.038 0.041 0.043
0.039 0.038 0.045 0.051 0.054 0.055
0.071 0.071 0.078 0.086 0.088 0.094
0.105 0.098 0.104 0.118 0.120 0.095
0.141 0.132 0.136 0.149 0.161 0.140
0.011 0.010 0.011 0.014 0.012 0.023
0.008 0.008 0.009 0.012 0.012 0.014
0.009 0.008 0.011 0.013 0.015 0.016
0.015 0.014 0.017 0.020 0.024 0.023
0.043 0.042 0.048 0.053 0.063 0.053
0.120 0.114 0.127 0.153 0.162 0.174
0.204 0.193 0.230 0.248 0.254 0.225
FNIR(R=50, T=3734.000000), FPIR(30−45, Male) = 0.001
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
cloudwalk hr 000
cogent 007
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


R: Decline of genuine scores with ageing, with some eventually dropping below typical thresholds shown by the horizontal lines
5000
4500
4000
3500
Score
(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