A: Datasheet

Algorithm: revealmedia_000

Developer: Reveal Media Ltd

Submission Date: 2022_02_02

Template size: 2052 bytes

Template time (2.5 percentile): 382 msec

Template time (median): 384 msec

Template time (97.5 percentile): 387 msec

Investigation:

Frontal mugshot ranking 65 (out of 341) −− FNIR(1600000, 0, 1) = 0.0019 vs. lowest 0.0008 from sensetime_007

Mugshot webcam ranking 32 (out of 303) −− FNIR(1600000, 0, 1) = 0.0097 vs. lowest 0.0056 from sensetime_007

Mugshot profile ranking 66 (out of 272) −− FNIR(1600000, 0, 1) = 0.2747 vs. lowest 0.0521 from sensetime_007

Immigration visa−border ranking 27 (out of 230) −− FNIR(1600000, 0, 1) = 0.0022 vs. lowest 0.0008 from sensetime_007

Immigration visa−kiosk ranking 26 (out of 227) −− FNIR(1600000, 0, 1) = 0.0738 vs. lowest 0.0487 from cubox_000

Identification:

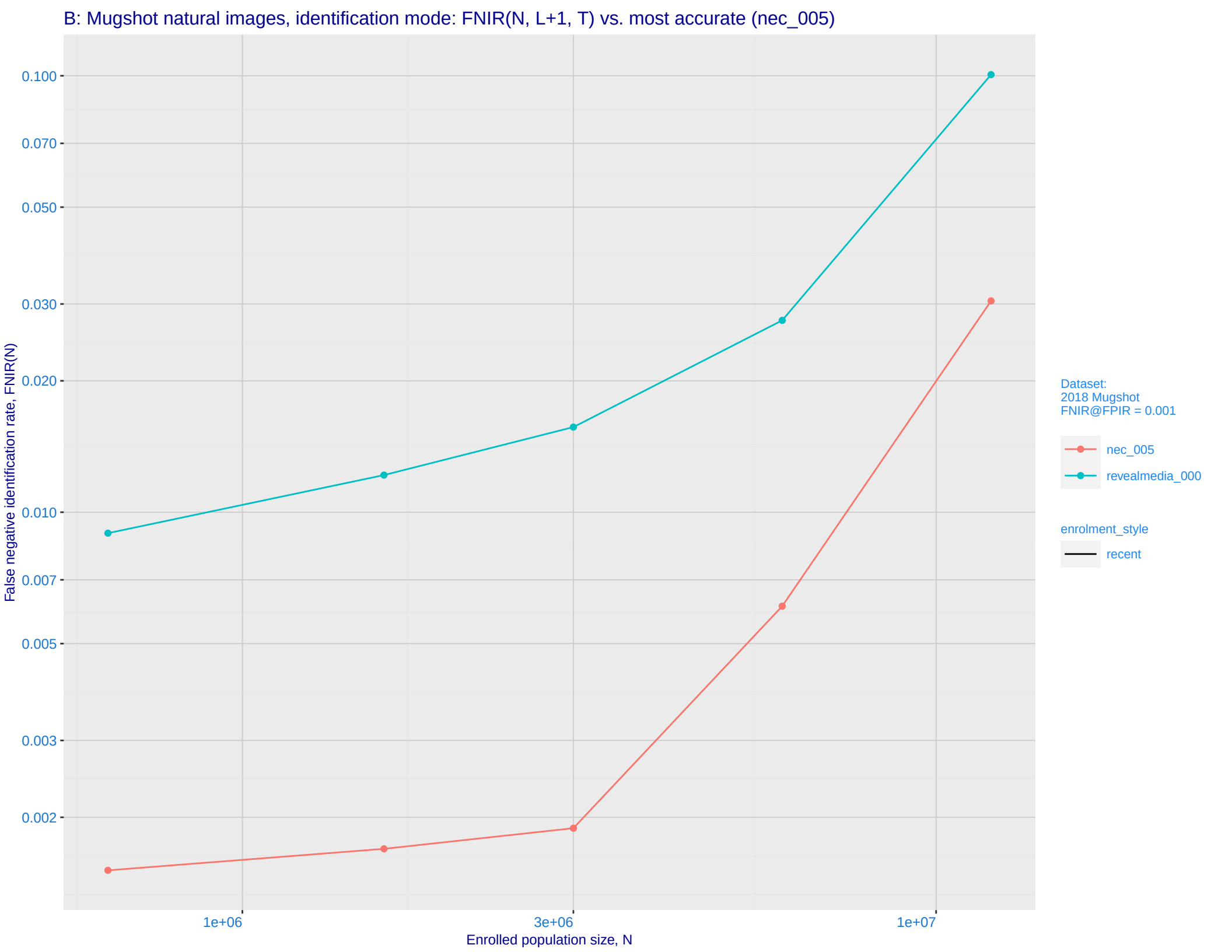
Frontal mugshot ranking 52 (out of 341) −− FNIR(1600000, T, L+1) = 0.0122, FPIR=0.001000 vs. lowest 0.0014 from sensetime_007

Mugshot webcam ranking 49 (out of 301) −− FNIR(1600000, T, L+1) = 0.0421, FPIR=0.001000 vs. lowest 0.0093 from sensetime_007

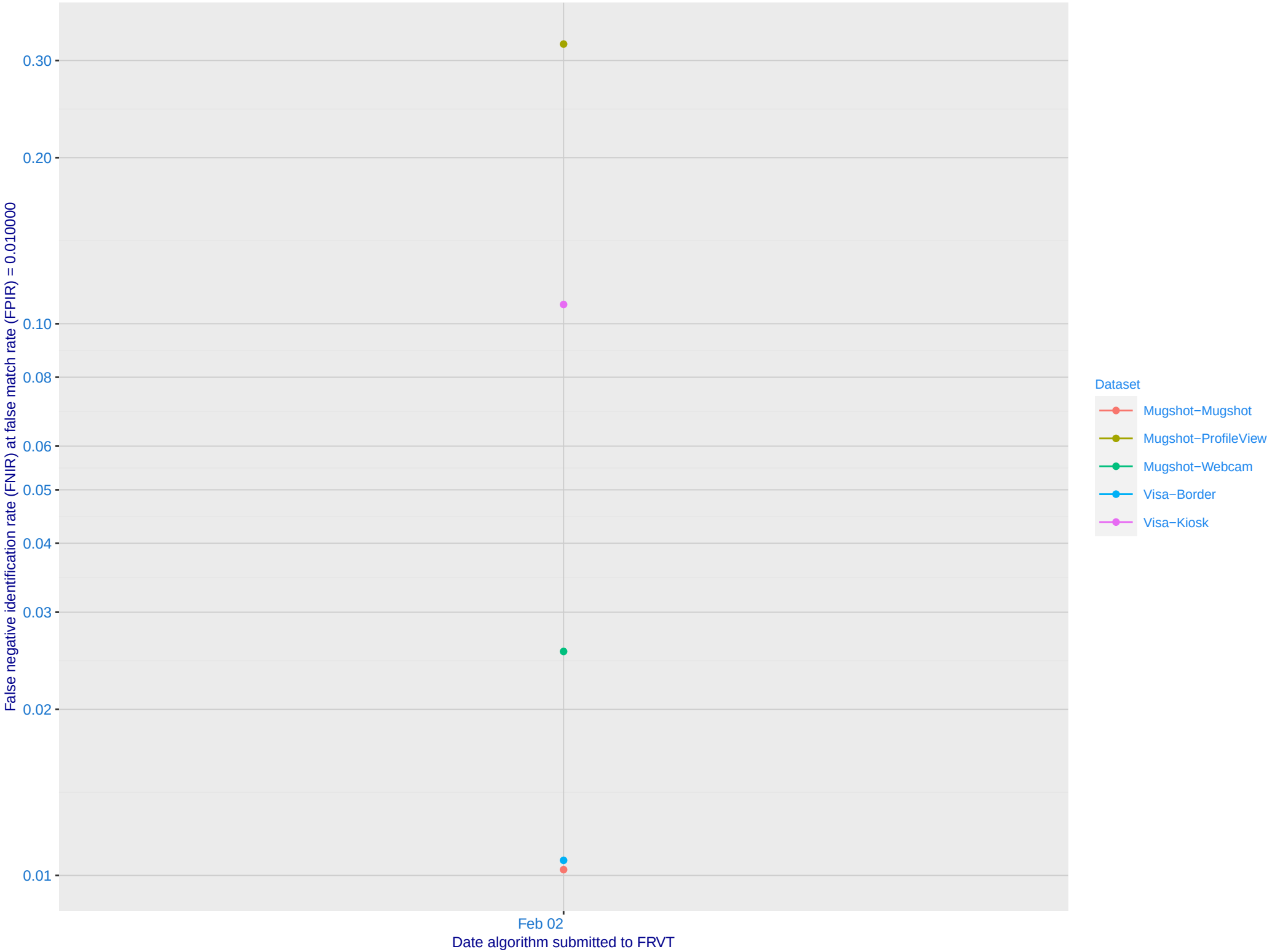
Mugshot profile ranking 39 (out of 271) −− FNIR(1600000, T, L+1) = 0.6816, FPIR=0.001000 vs. lowest 0.1093 from cloudwalk_mt_000

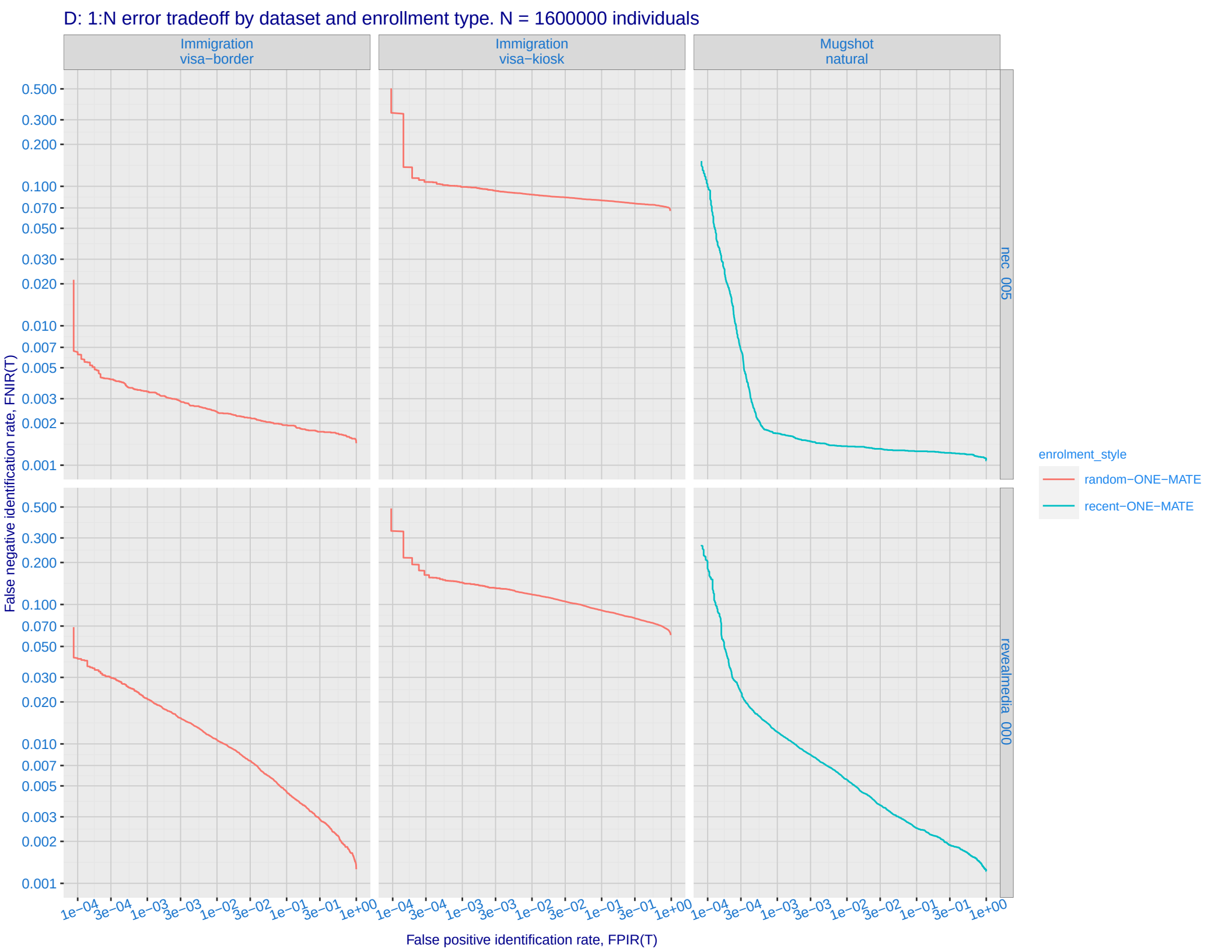
Immigration visa−border ranking 53 (out of 229) −− FNIR(1600000, T, L+1) = 0.0211, FPIR=0.001000 vs. lowest 0.0024 from cloudwalk_mt_000

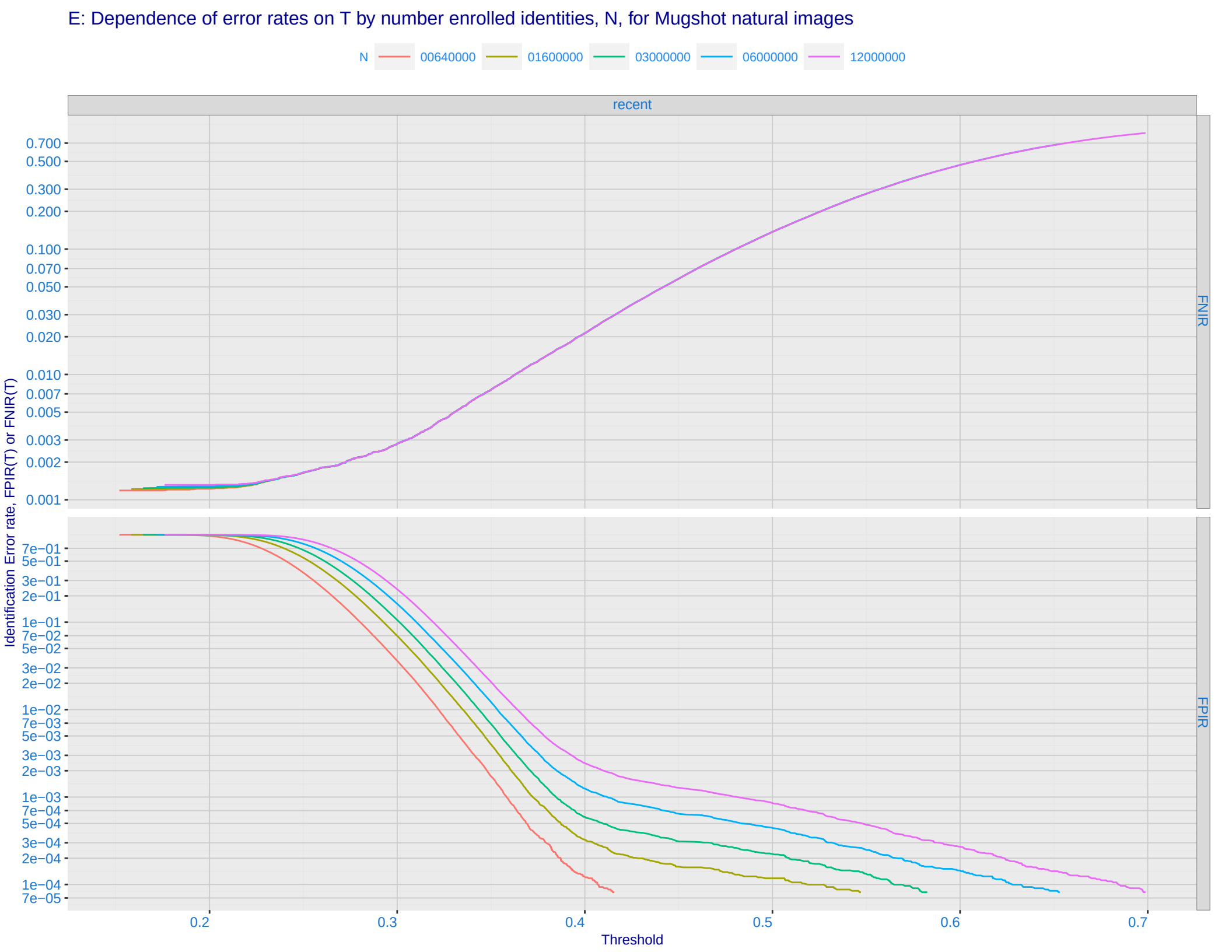
Immigration visa−kiosk ranking 30 (out of 224) −− FNIR(1600000, T, L+1) = 0.1438, FPIR=0.001000 vs. lowest 0.0719 from cloudwalk_mt_000

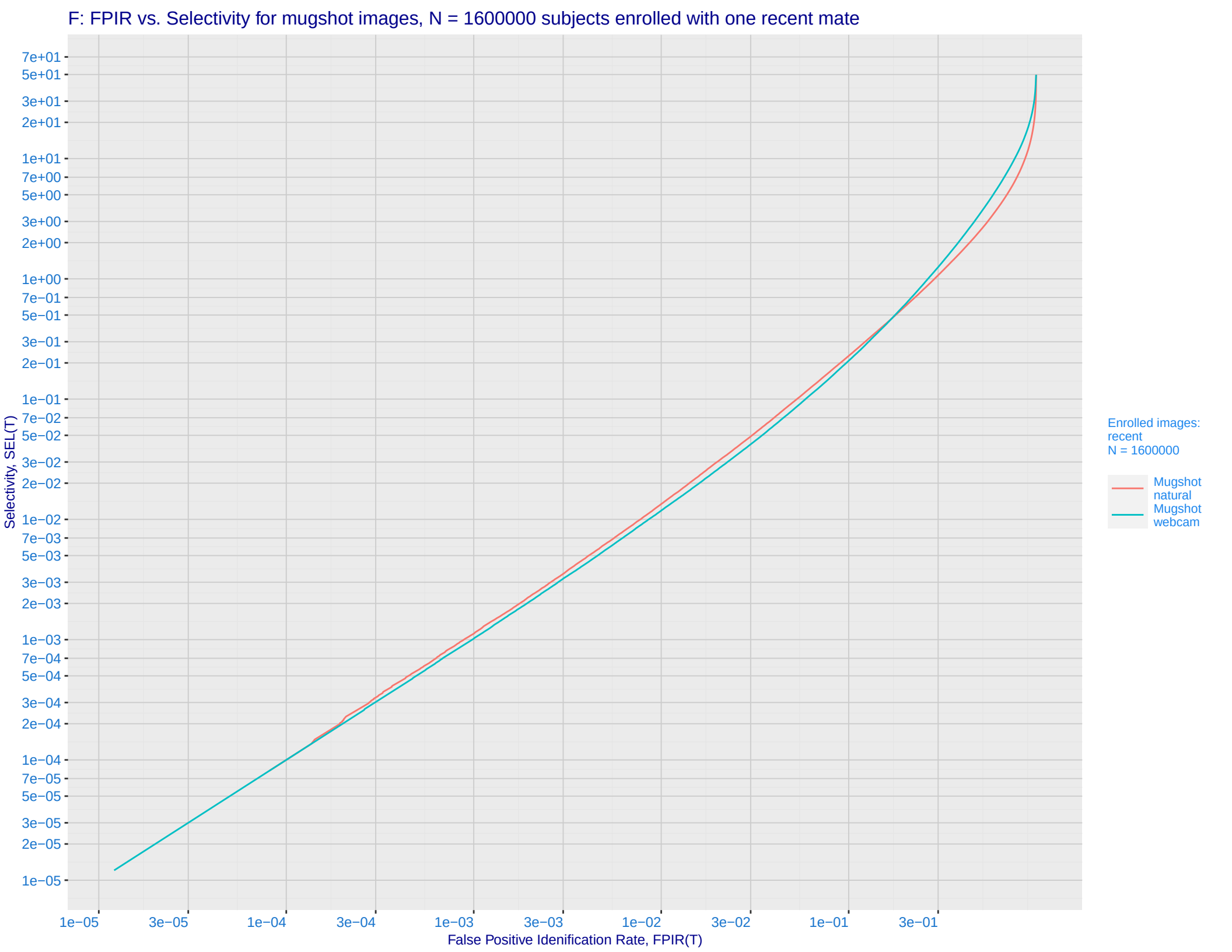

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (nec_005)
False negative identification rate, FNIR(N)
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
1e+06
3e+06
1e+07
Enrolled population size, N
Dataset:
2018 Mugshot
FNIR@FPIR = 0.001
nec_005
revealmedia_000
enrolment_style
recent

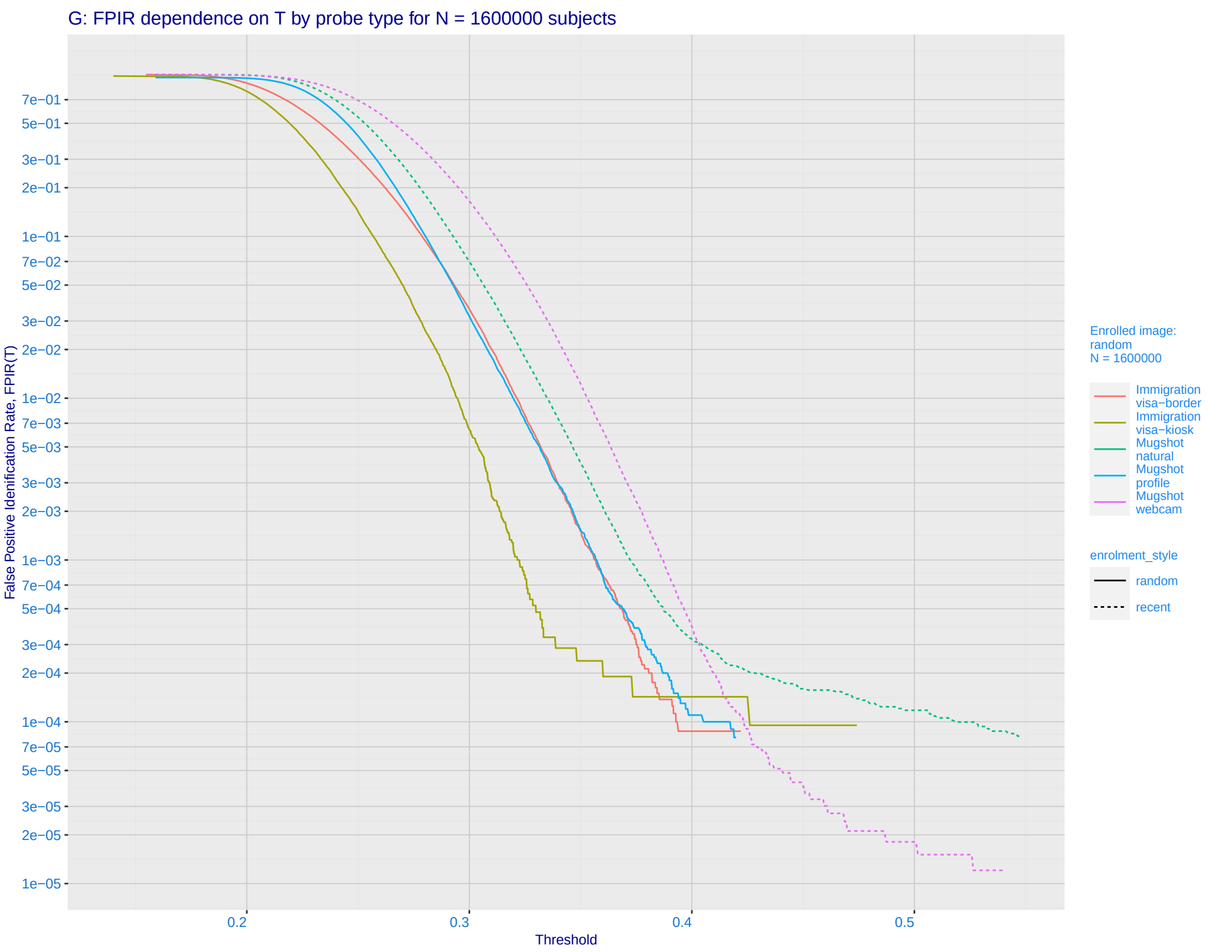
C: Evolution of accuracy for REVEALMEDIA algorithms on three datasets 2018 − present

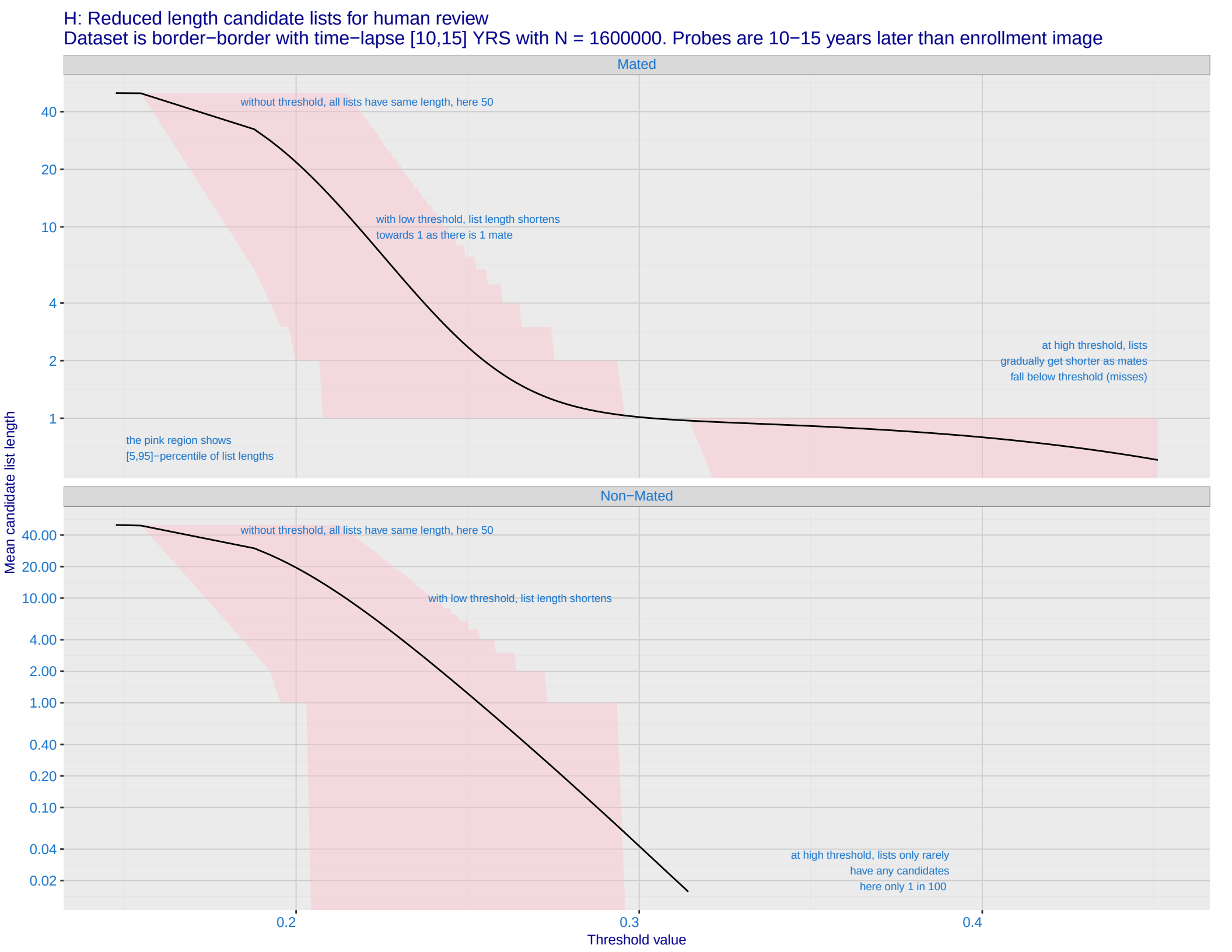


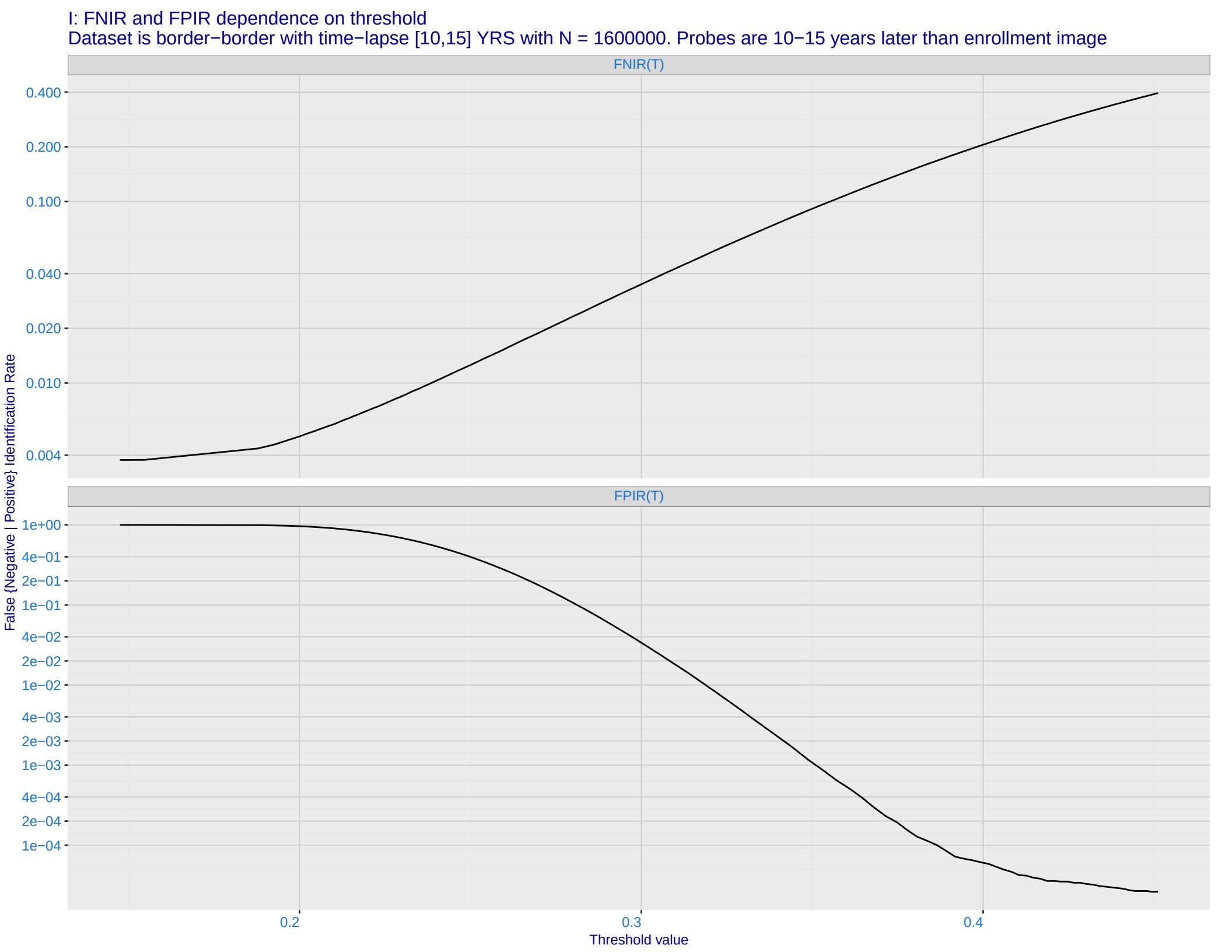

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
nec_005
revealmedia_000
False negative identification rate, FNIR(T)
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
3e−04
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

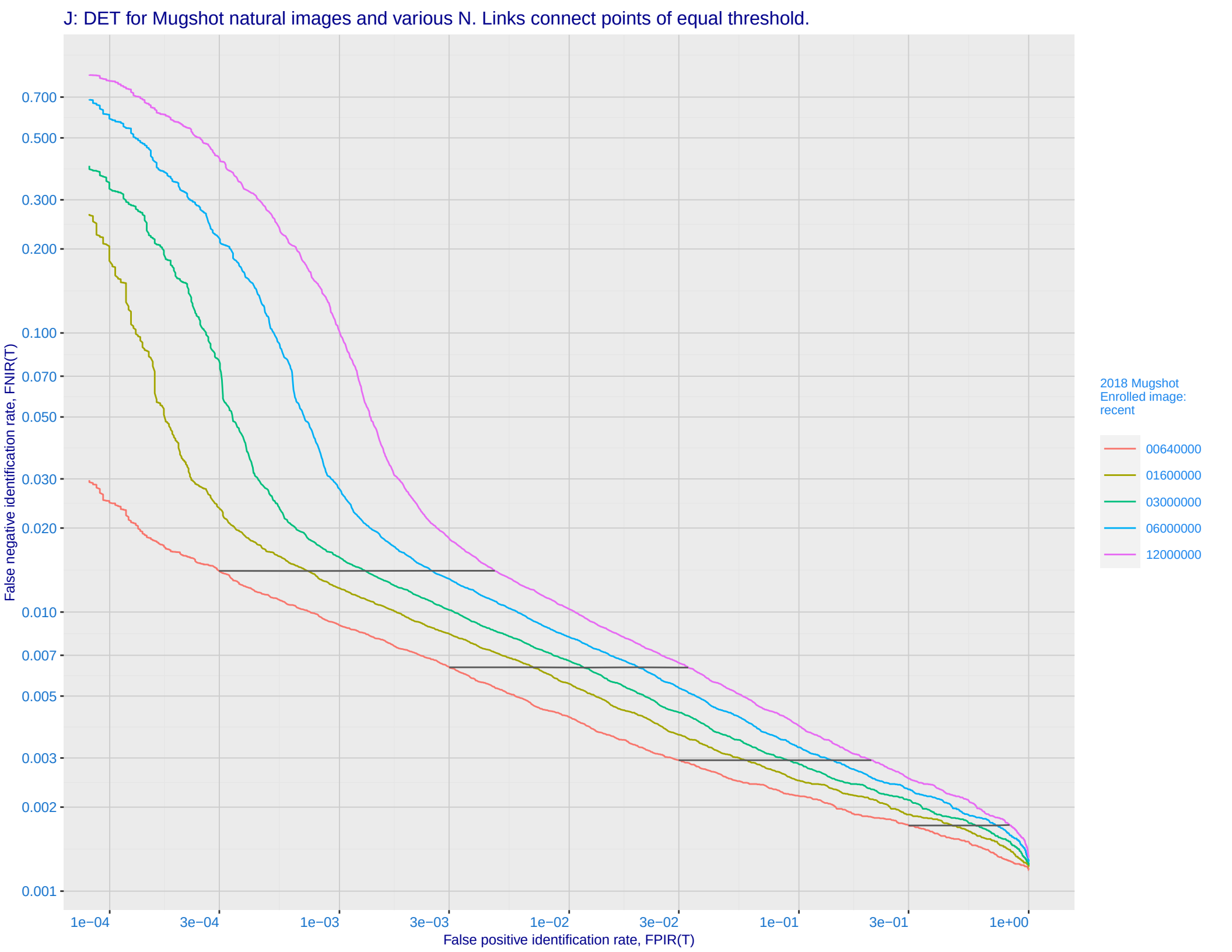

E: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images
N
00640000
01600000
03000000
06000000
12000000
recent
FNIR
FPIR
Identification Error rate, FPIR(T) or FNIR(T)
Threshold
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
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
0.2
0.3
0.4
0.5
0.6
0.7

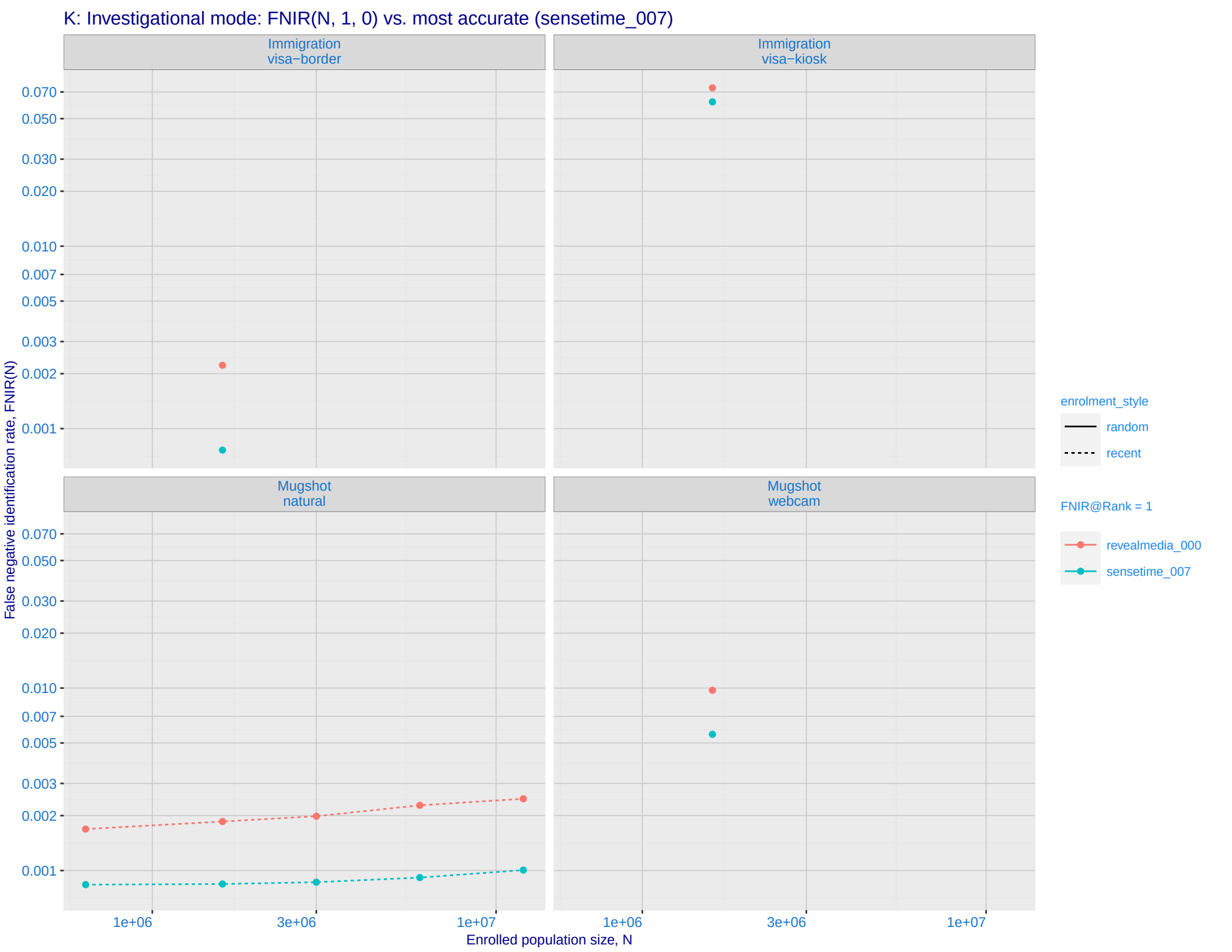

F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate
Selectivity, SEL(T)
7e+01
5e+01
3e+01
2e+01
1e+01
7e+00
5e+00
3e+00
2e+00
1e+00
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05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

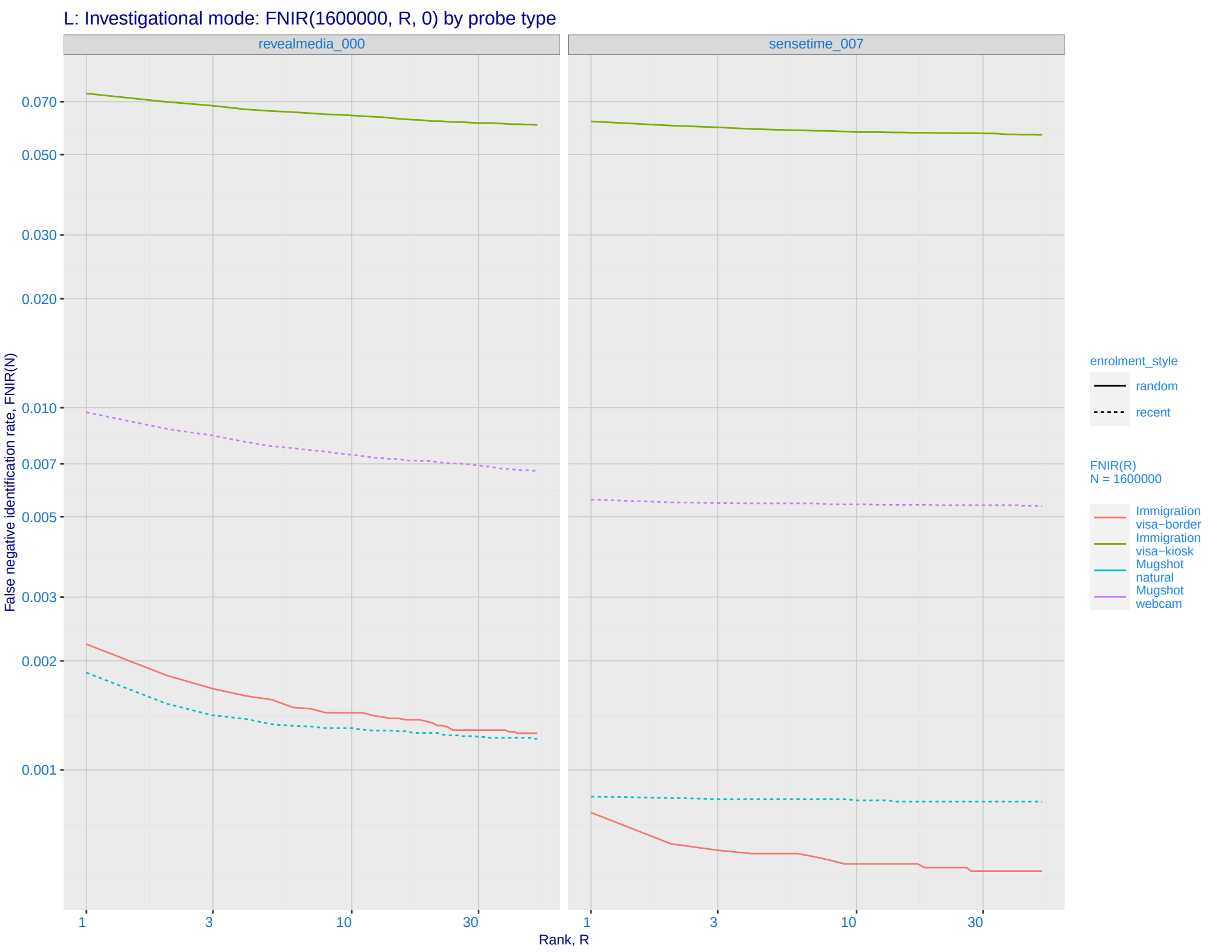

G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Idenification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
0.2
0.3
0.4
0.5
Threshold
Enrolled image:
random
N = 1600000
Immigration
visa−border
Immigration
visa−kiosk
Mugshot
natural
Mugshot
profile
Mugshot
webcam
enrolment_style
random
recent

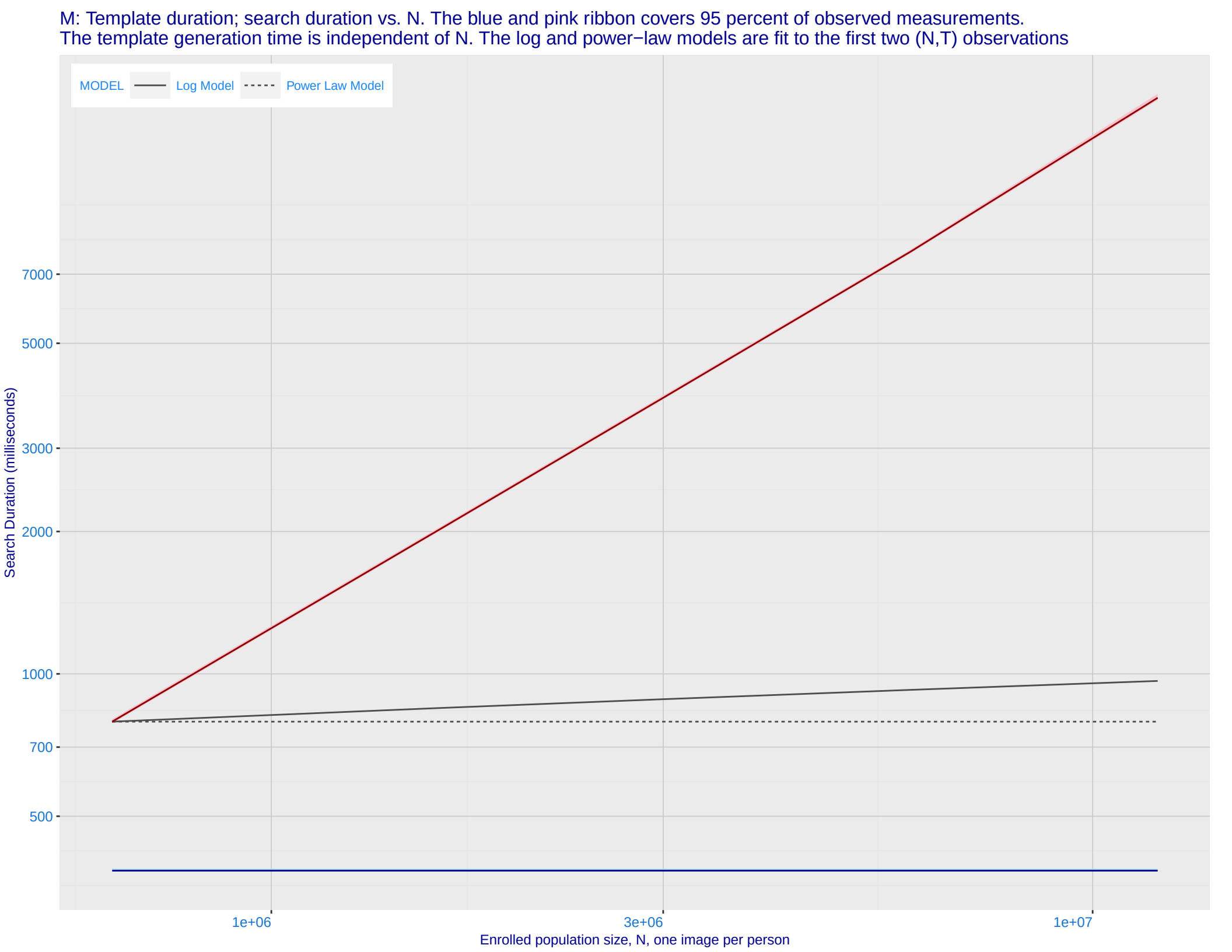

H: Reduced length candidate lists for human review
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
Mated
without threshold, all lists have same length, here 50
with low threshold, list length shortens
towards 1 as there is 1 mate
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
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
0.2
0.3
0.4
Threshold value

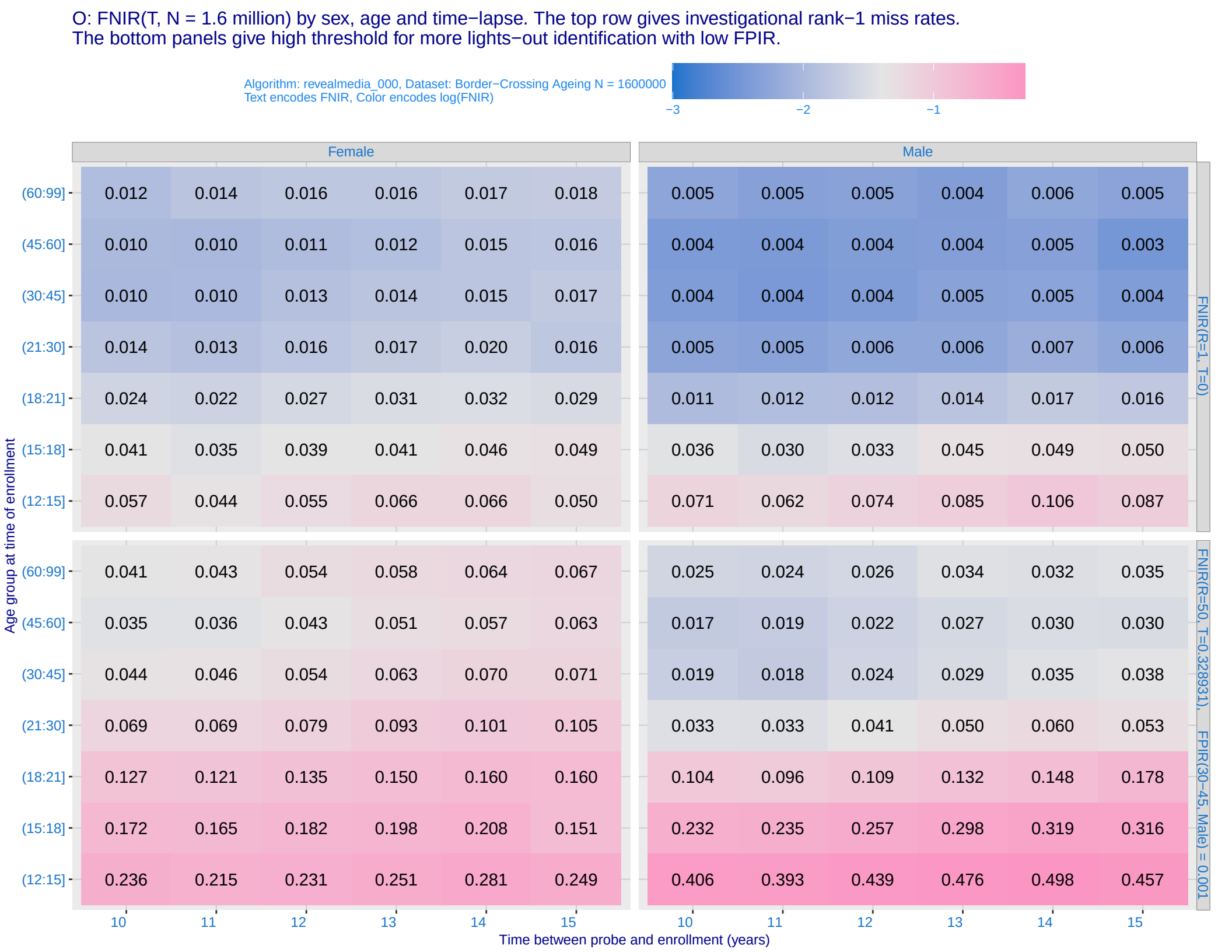

I: FNIR and FPIR dependence on threshold
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
FNIR(T)
0.400
0.200
0.100
0.040
0.020
0.010
0.004
FPIR(T)
1e+00
4e−01
2e−01
1e−01
4e−02
2e−02
1e−02
4e−03
2e−03
1e−03
4e−04
2e−04
1e−04
False {Negative | Positive} Identification Rate
0.2
0.3
0.4
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

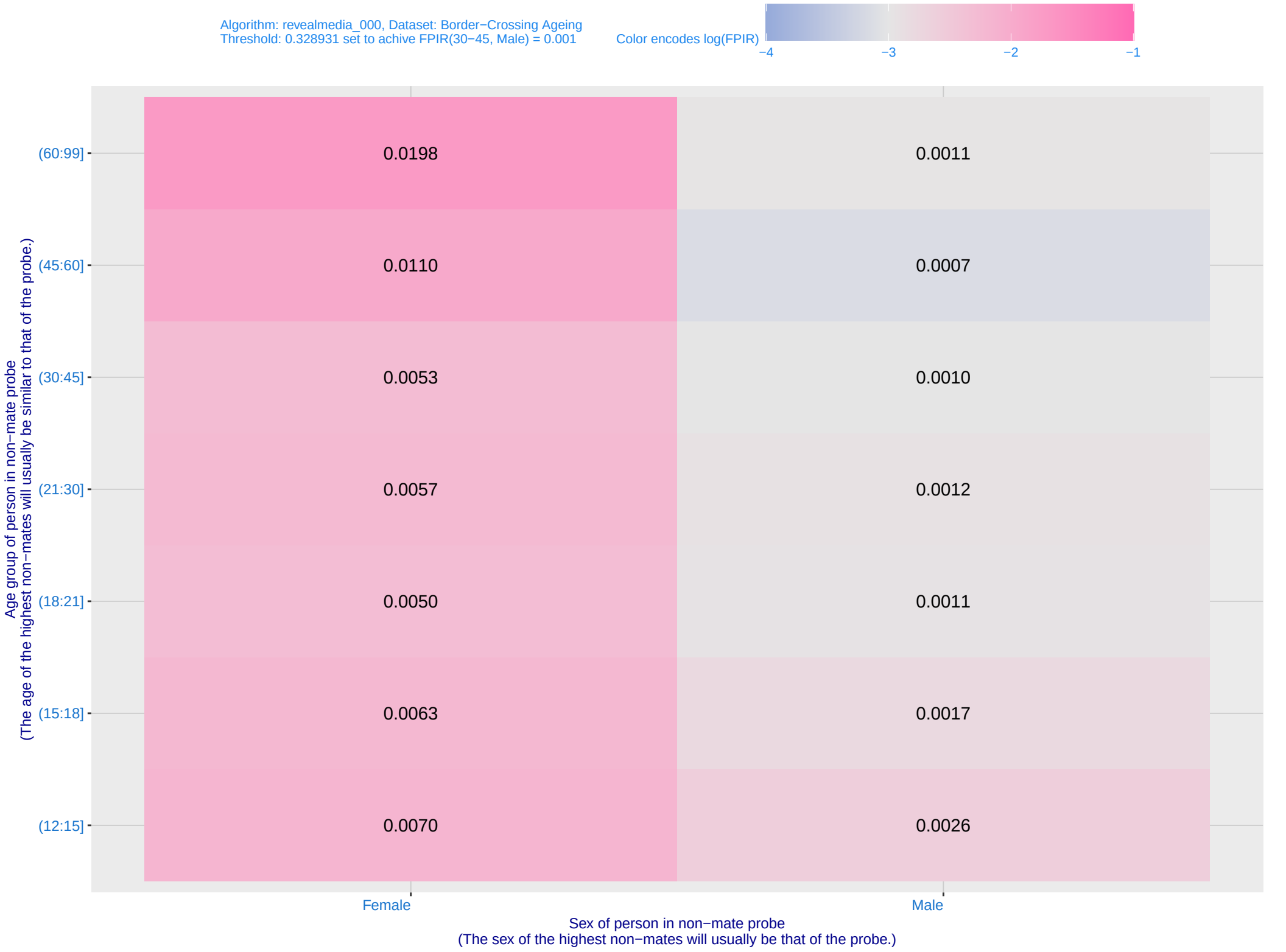

K: Investigational mode: FNIR(N, 1, 0) vs. most accurate (sensetime_007)
Immigration
visa−border
Immigration
visa−kiosk
Mugshot
natural
Mugshot
webcam
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
False negative identification rate, FNIR(N)
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
random
recent
FNIR@Rank = 1
revealmedia_000
sensetime_007

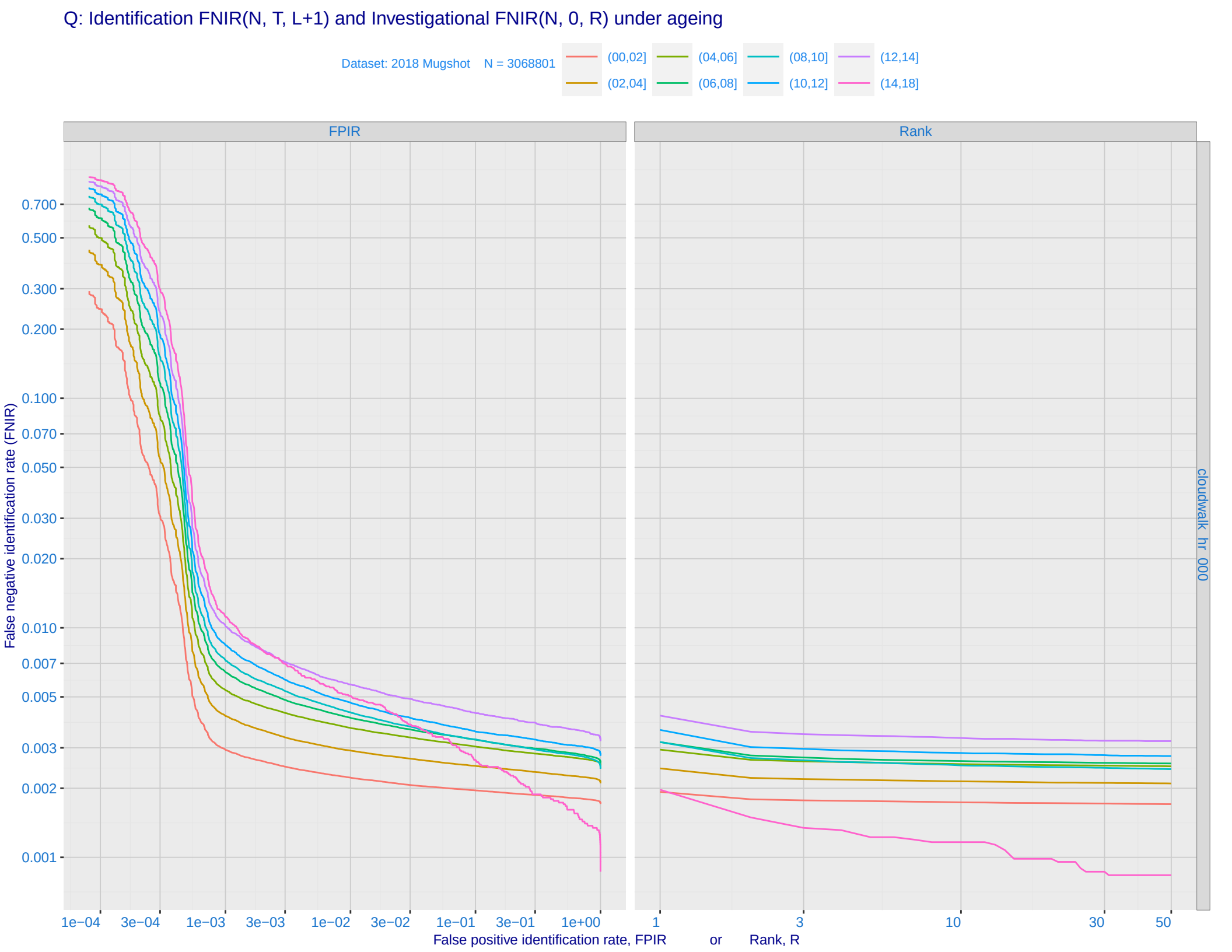

L: Investigational mode: FNIR(1600000, R, 0) by probe type
revealmedia_000
sensetime_007
False negative identification rate, FNIR(N)
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1
3
10
30
Rank, R
enrolment_style
random
recent
FNIR(R)
N = 1600000
Immigration visa−border
Immigration visa−kiosk
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
MODEL
Log Model
Power Law Model
7000
5000
3000
2000
1000
700
500
Search Duration (milliseconds)
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: revealmedia_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]
0.012 0.014 0.016 0.016 0.017 0.018
0.010 0.010 0.011 0.012 0.015 0.016
0.010 0.010 0.013 0.014 0.015 0.017
0.014 0.013 0.016 0.017 0.020 0.016
0.024 0.022 0.027 0.031 0.032 0.029
0.041 0.035 0.039 0.041 0.046 0.049
0.057 0.044 0.055 0.066 0.066 0.050
0.005 0.005 0.005 0.004 0.006 0.005
0.004 0.004 0.004 0.004 0.005 0.003
0.004 0.004 0.004 0.005 0.005 0.004
0.005 0.005 0.006 0.006 0.007 0.006
0.011 0.012 0.012 0.014 0.017 0.016
0.036 0.030 0.033 0.045 0.049 0.050
0.071 0.062 0.074 0.085 0.106 0.087
FNIR(R=1, T=0)
0.041 0.043 0.054 0.058 0.064 0.067
0.035 0.036 0.043 0.051 0.057 0.063
0.044 0.046 0.054 0.063 0.070 0.071
0.069 0.069 0.079 0.093 0.101 0.105
0.127 0.121 0.135 0.150 0.160 0.160
0.172 0.165 0.182 0.198 0.208 0.151
0.236 0.215 0.231 0.251 0.281 0.249
0.025 0.024 0.026 0.034 0.032 0.035
0.017 0.019 0.022 0.027 0.030 0.030
0.019 0.018 0.024 0.029 0.035 0.038
0.033 0.033 0.041 0.050 0.060 0.053
0.104 0.096 0.109 0.132 0.148 0.178
0.232 0.235 0.257 0.298 0.319 0.316
0.406 0.393 0.439 0.476 0.498 0.457
FNIR(R=50, T=0.328931), 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
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