A: Datasheet

Algorithm: cubox_000

Developer: Cubox

Submission Date: 2021_08_24

Template size: 2048 bytes

Template time (2.5 percentile): 916 msec

Template time (median): 918 msec

Template time (97.5 percentile): 926 msec

Investigation:

Frontal mugshot ranking 16 (out of 299) −− FNIR(1600000, 0, 1) = 0.0014 vs. lowest 0.0009 from sensetime_006

Mugshot webcam ranking 24 (out of 261) −− FNIR(1600000, 0, 1) = 0.0099 vs. lowest 0.0057 from sensetime_006

Mugshot profile ranking 2 (out of 230) −− FNIR(1600000, 0, 1) = 0.0582 vs. lowest 0.0550 from sensetime_006

Immigration visa−border ranking 6 (out of 188) −− FNIR(1600000, 0, 1) = 0.0016 vs. lowest 0.0009 from sensetime_006

Immigration visa−kiosk ranking 1 (out of 185) −− FNIR(1600000, 0, 1) = 0.0487

Identification:

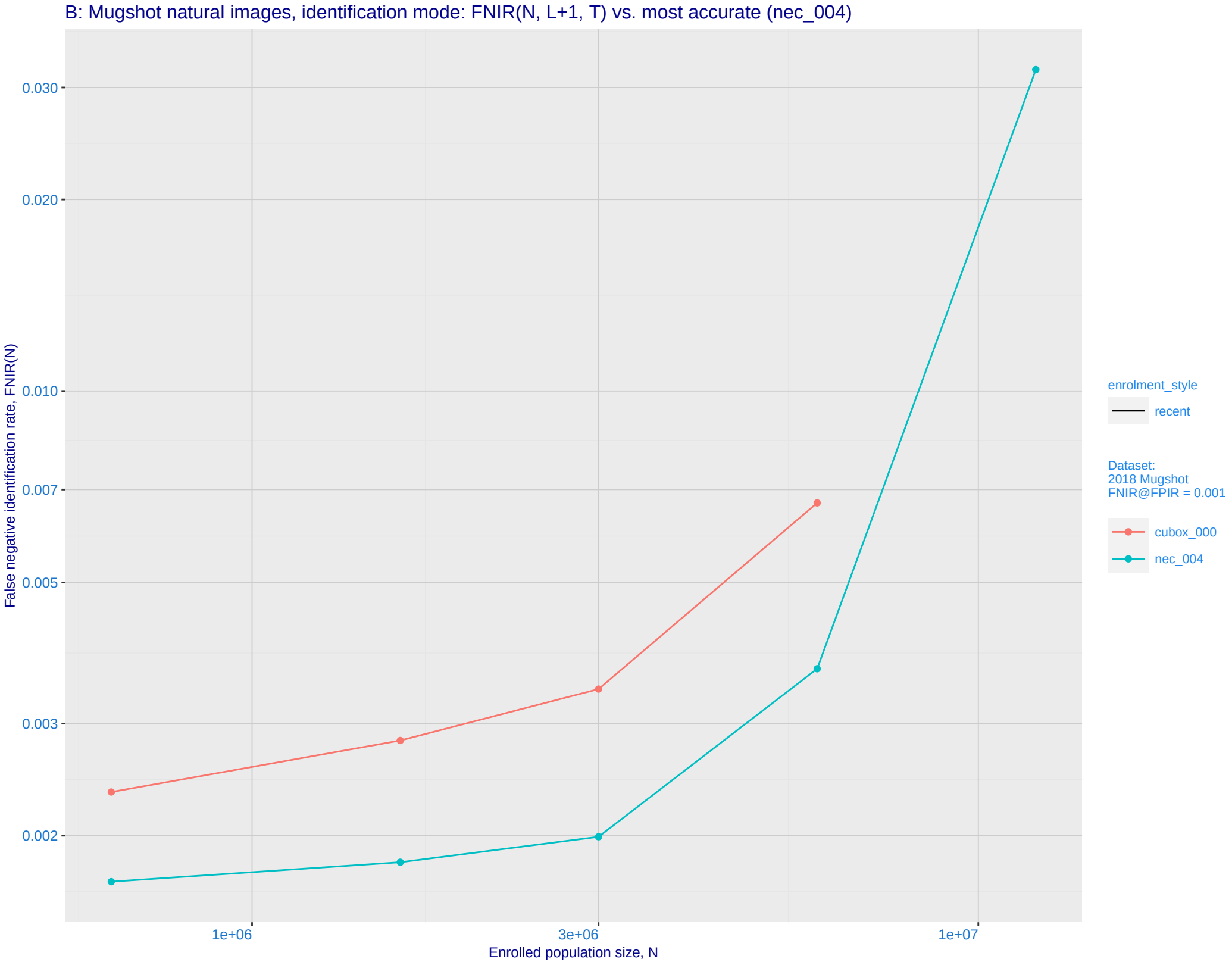
Frontal mugshot ranking 11 (out of 299) −− FNIR(1600000, T, L+1) = 0.0028, FPIR=0.001000 vs. lowest 0.0018 from sensetime_004

Mugshot webcam ranking 12 (out of 259) −− FNIR(1600000, T, L+1) = 0.0185, FPIR=0.001000 vs. lowest 0.0122 from sensetime_003

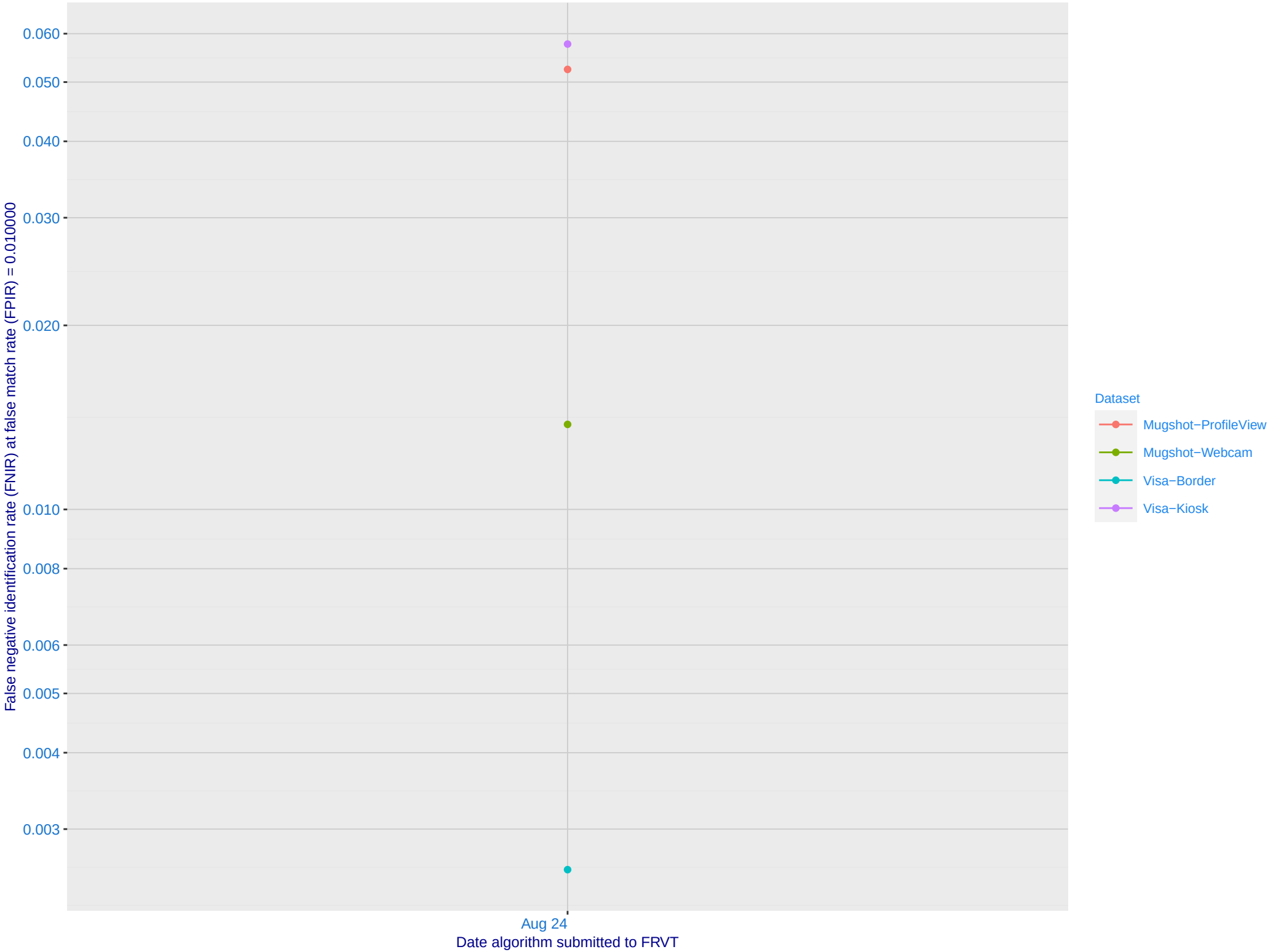
Mugshot profile ranking 2 (out of 229) −− FNIR(1600000, T, L+1) = 0.1680, FPIR=0.001000 vs. lowest 0.1331 from cloudwalk_hr_000

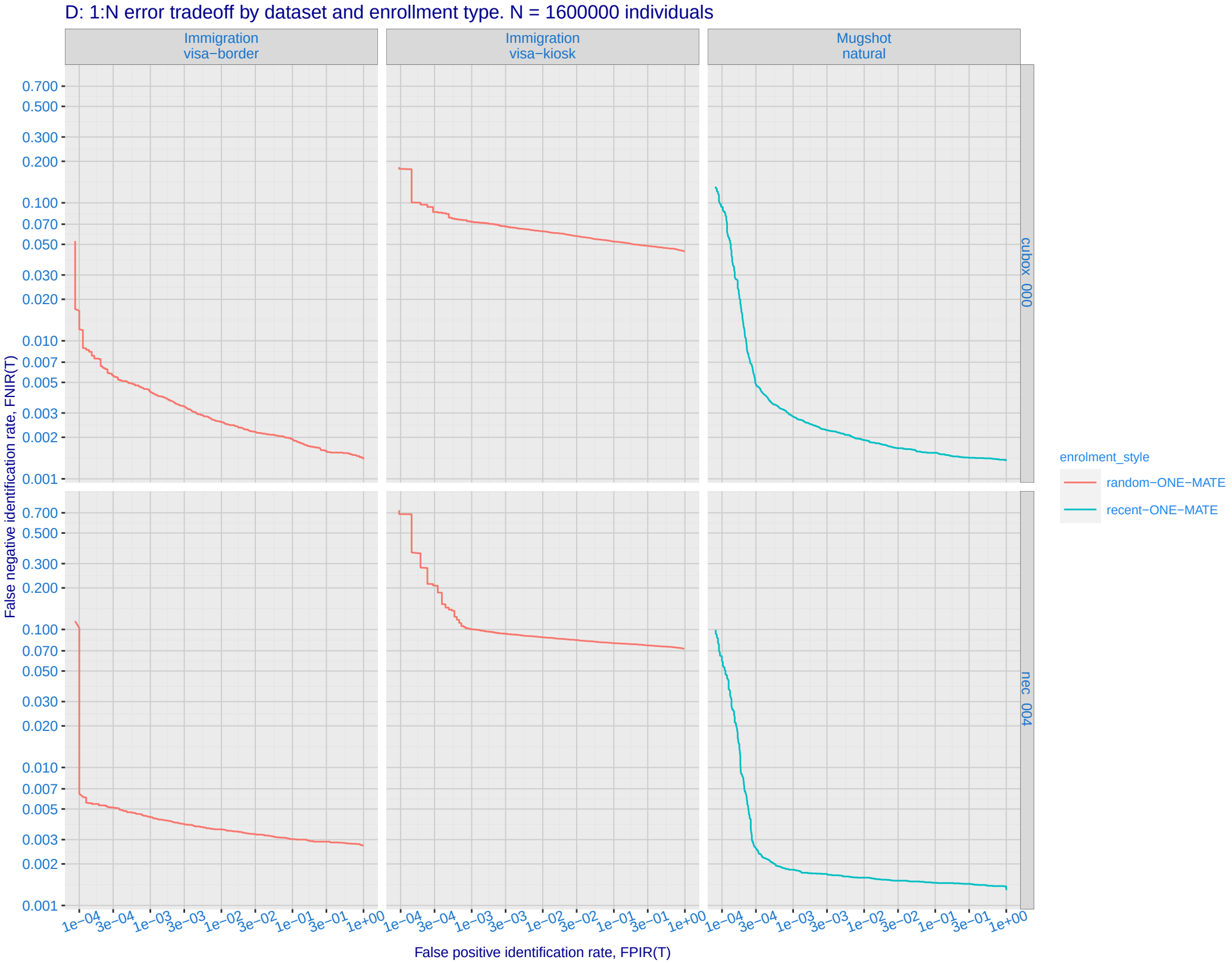
Immigration visa−border ranking 2 (out of 187) −− FNIR(1600000, T, L+1) = 0.0043, FPIR=0.001000 vs. lowest 0.0039 from sensetime_006

Immigration visa−kiosk ranking 1 (out of 182) −− FNIR(1600000, T, L+1) = 0.0729, FPIR=0.001000

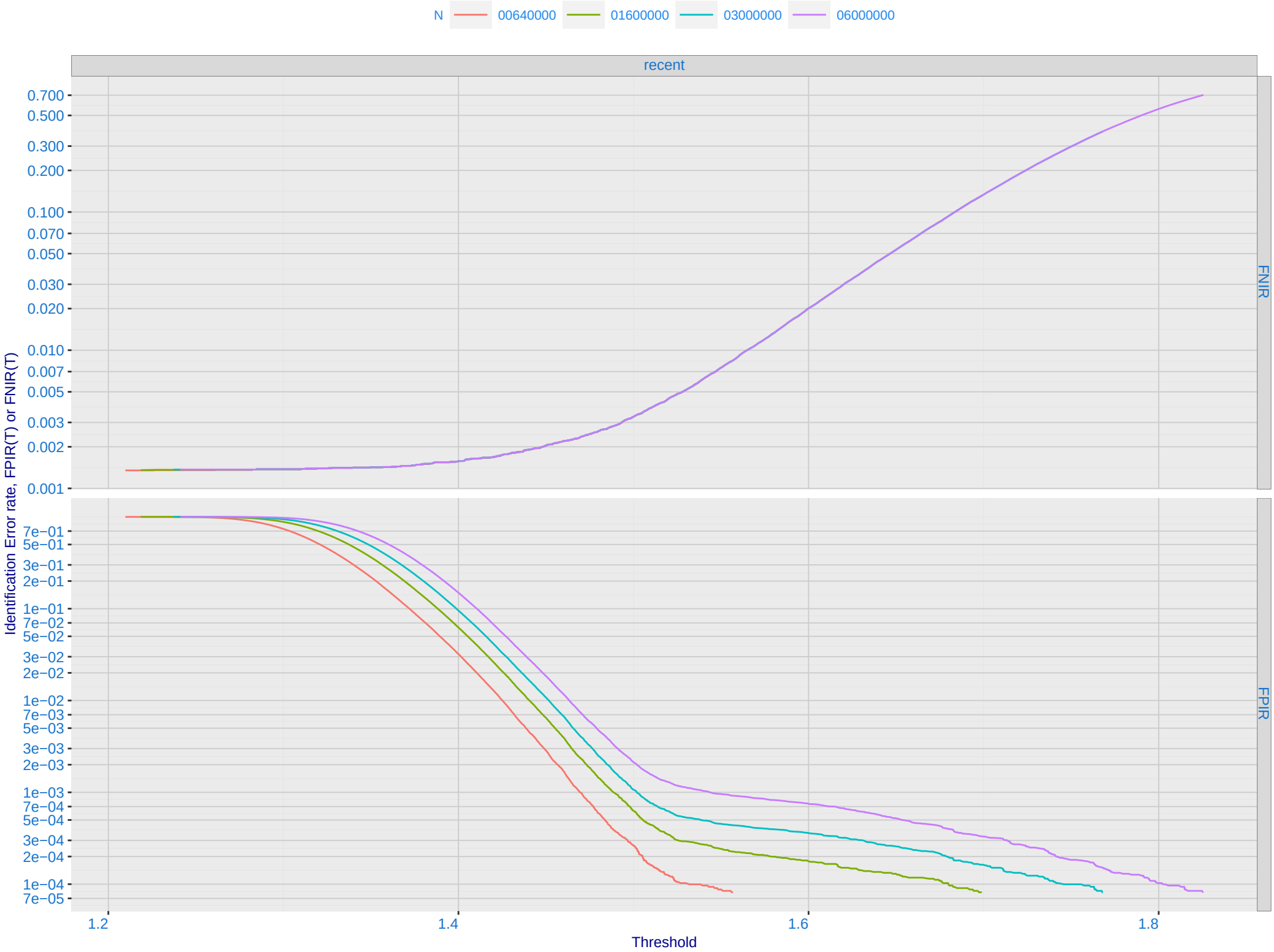

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (nec_004)
False negative identification rate, FNIR(N)
0.030
0.020
0.010
0.007
0.005
0.003
0.002
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
recent
Dataset:
2018 Mugshot
FNIR@FPIR = 0.001
cubox_000
nec_004

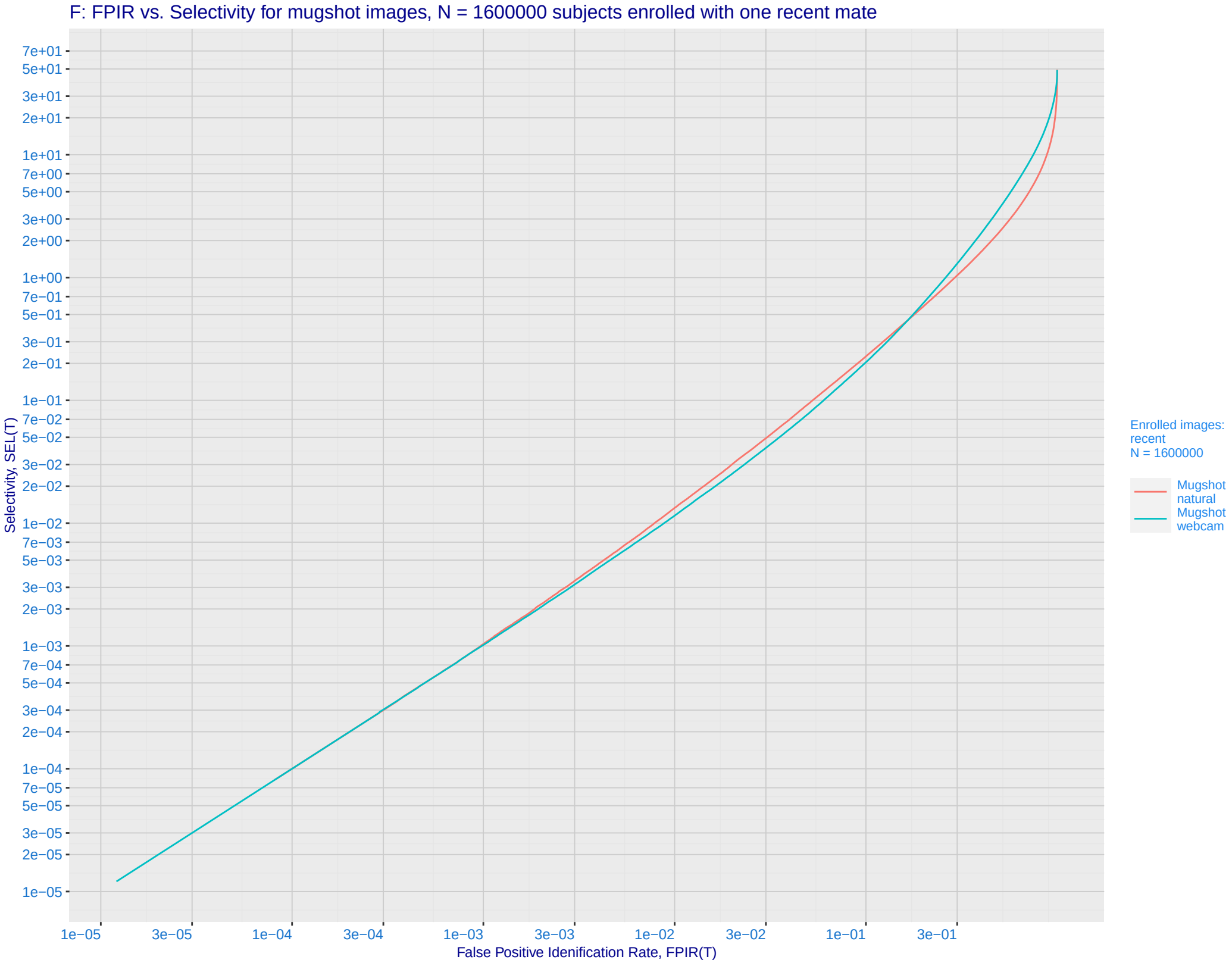
C: Evolution of accuracy for CUBOX algorithms on three datasets 2018 − present

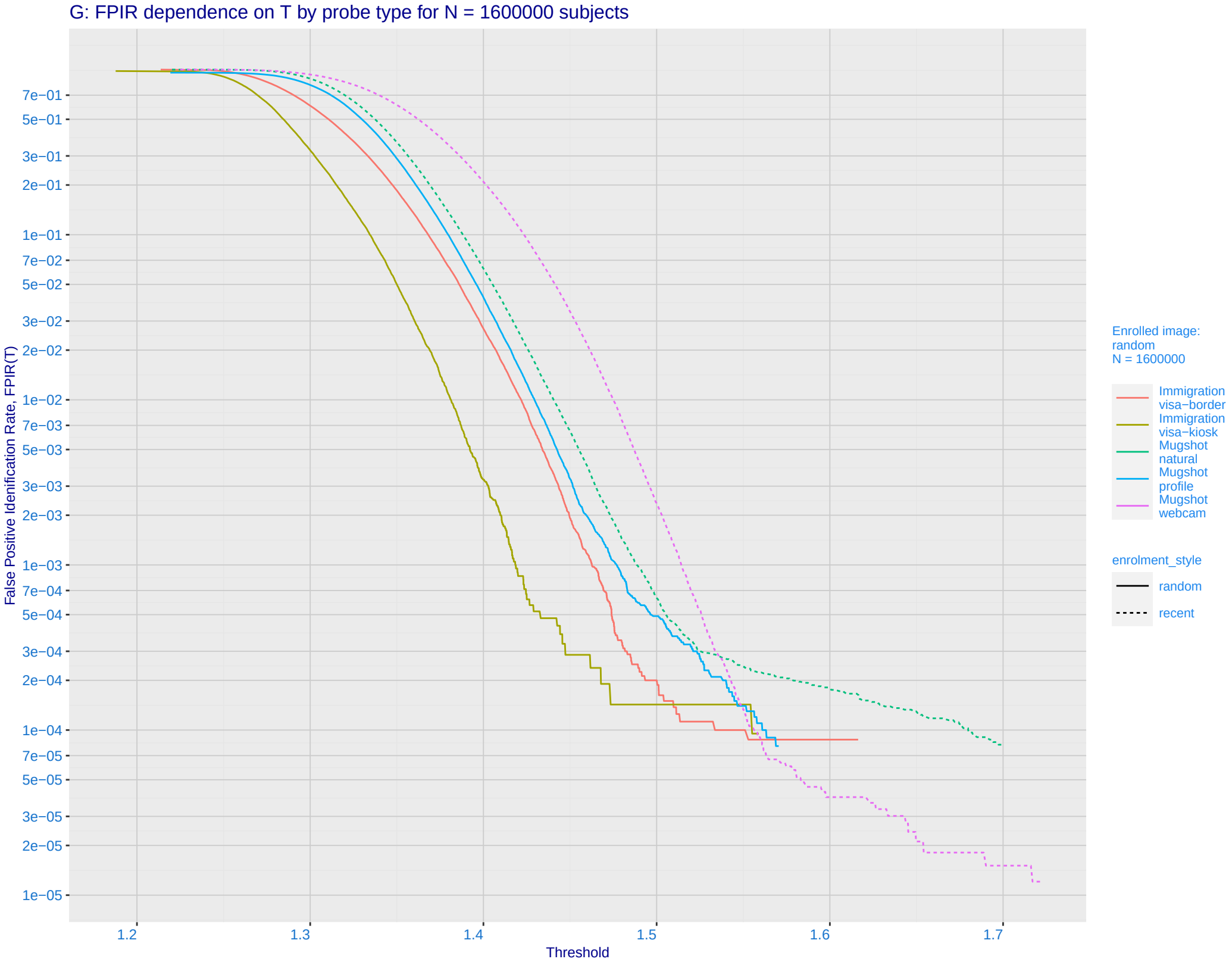



D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
cubox_000
nec_004
False negative identification rate, FNIR(T)
False positive identification rate, FPIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
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

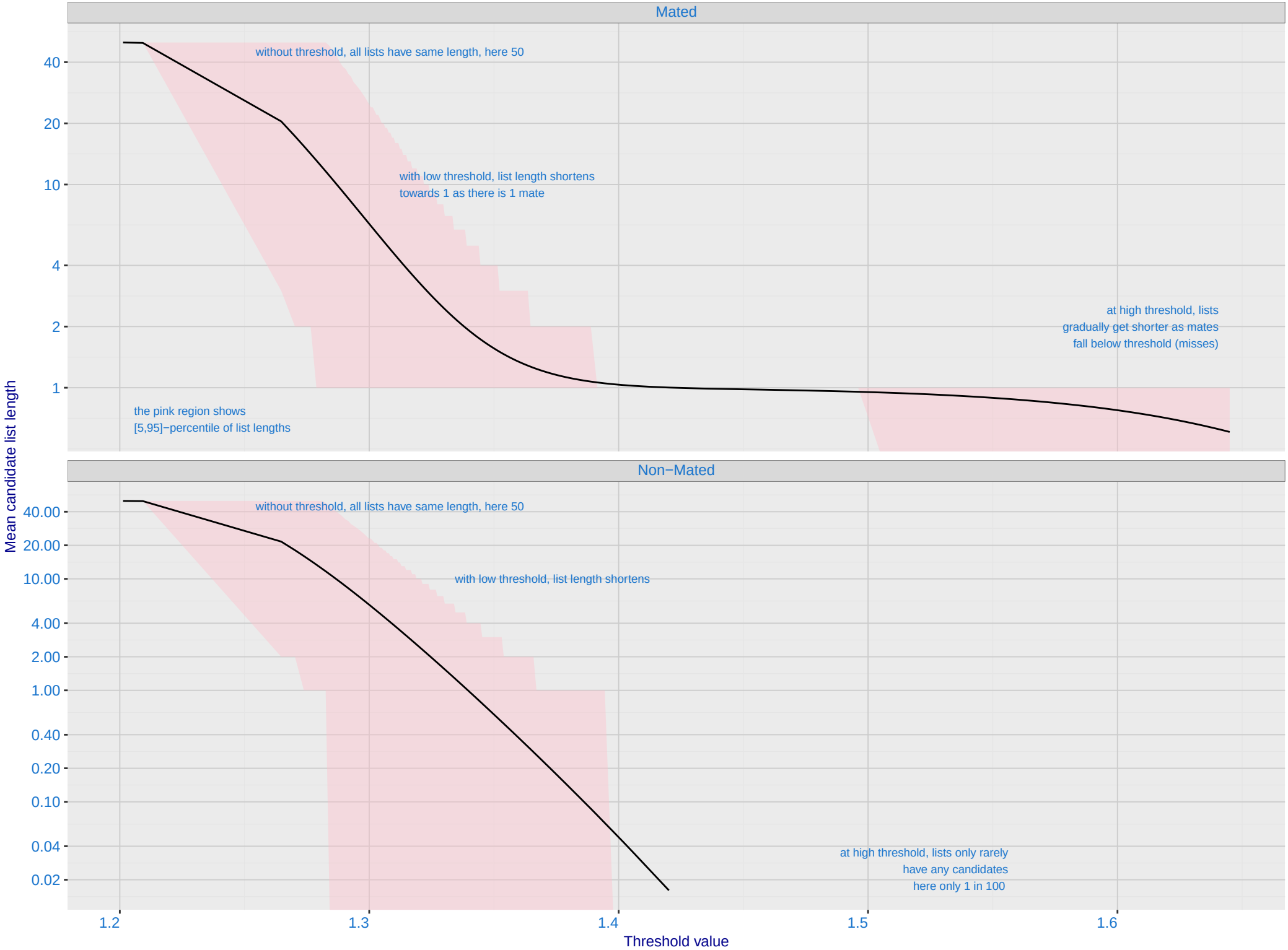
E: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images

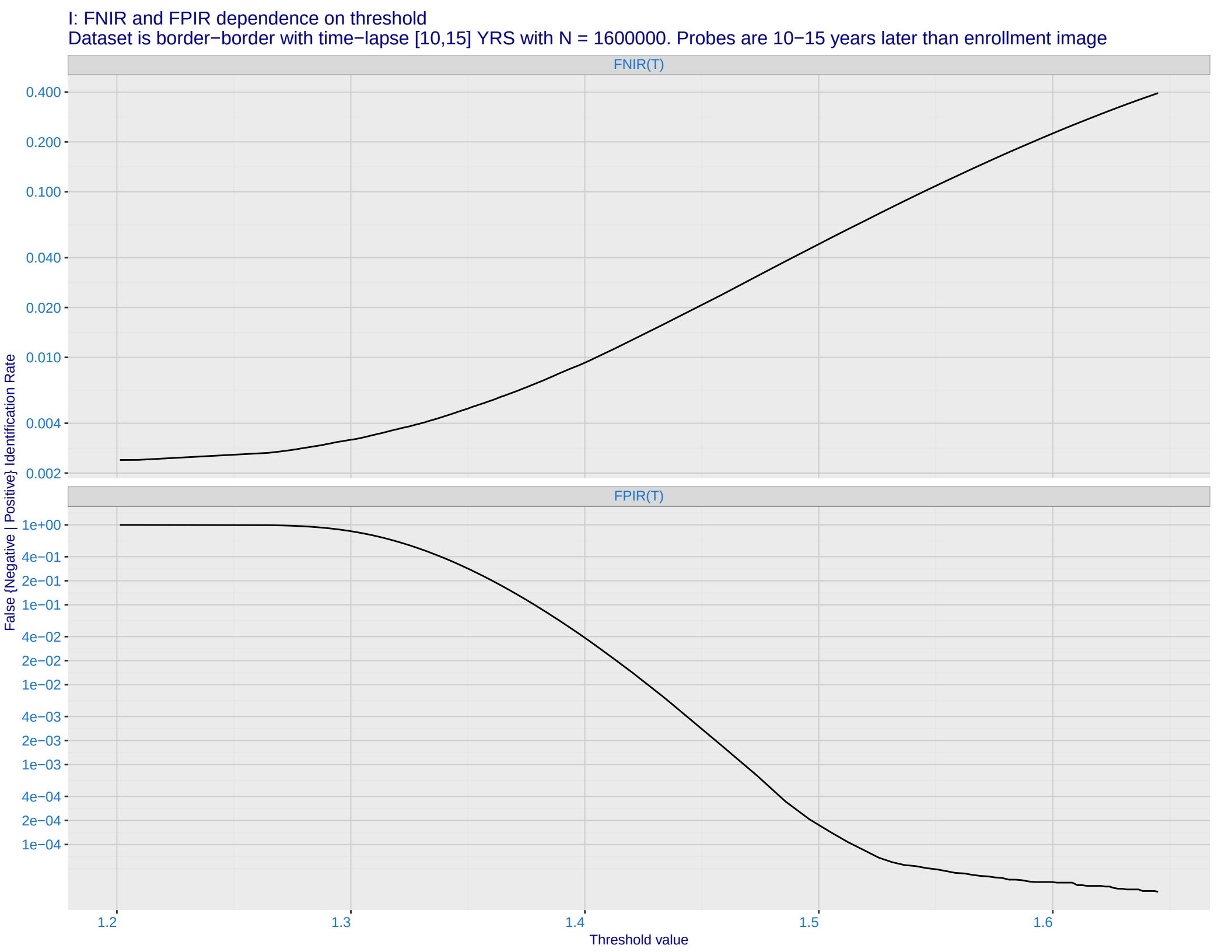



F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate
Selectivity, SEL(T)
7e+01
5e+01
3e+01
2e+01
1e+01
7e+00
5e+00
3e+00
2e+00
1e+00
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05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

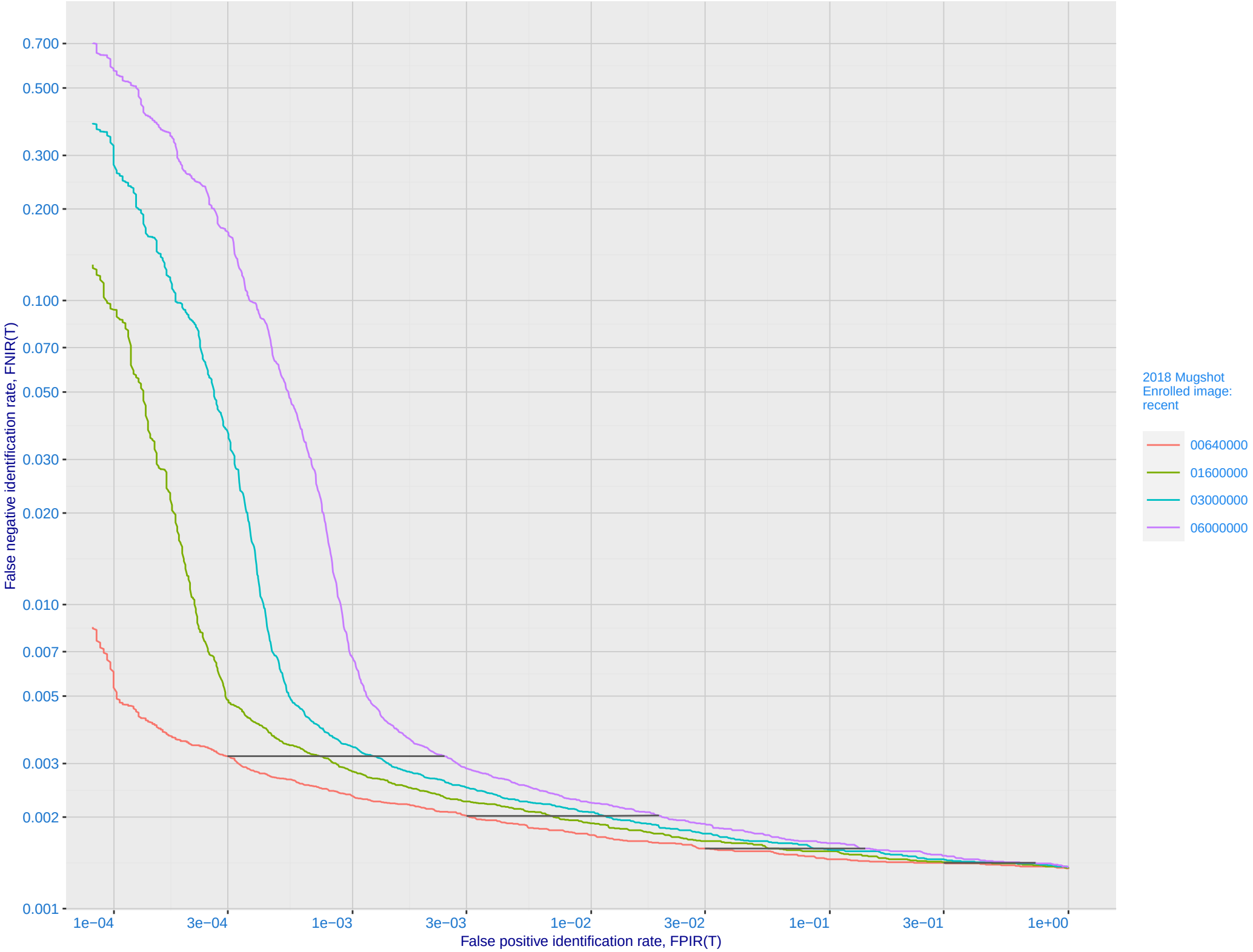

G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Idenification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
1.2
1.3
1.4
1.5
1.6
1.7
Threshold
Enrolled image:
random
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot profile
Mugshot webcam
enrolment_style
random
recent

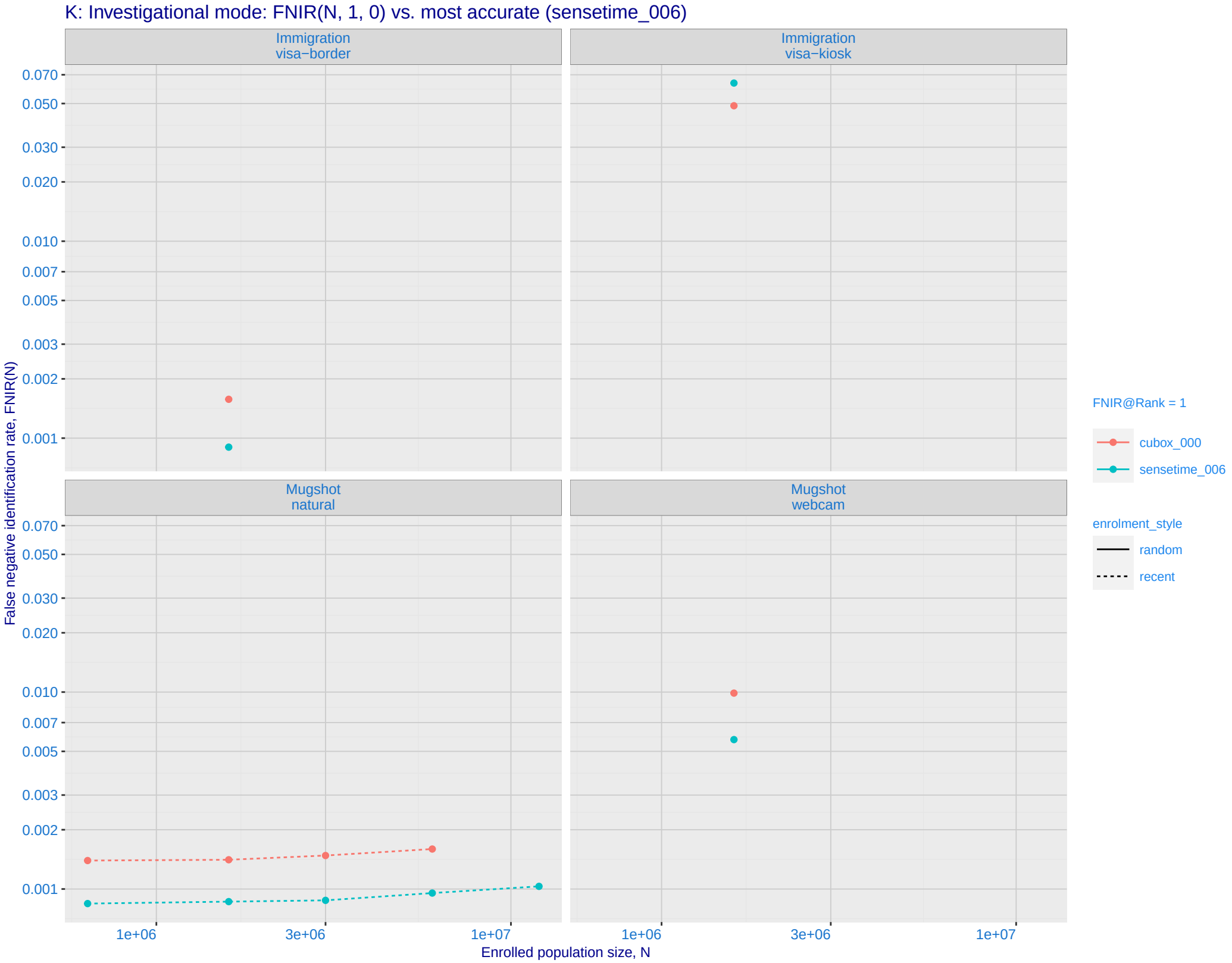
H: Reduced length candidate lists for human review
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image

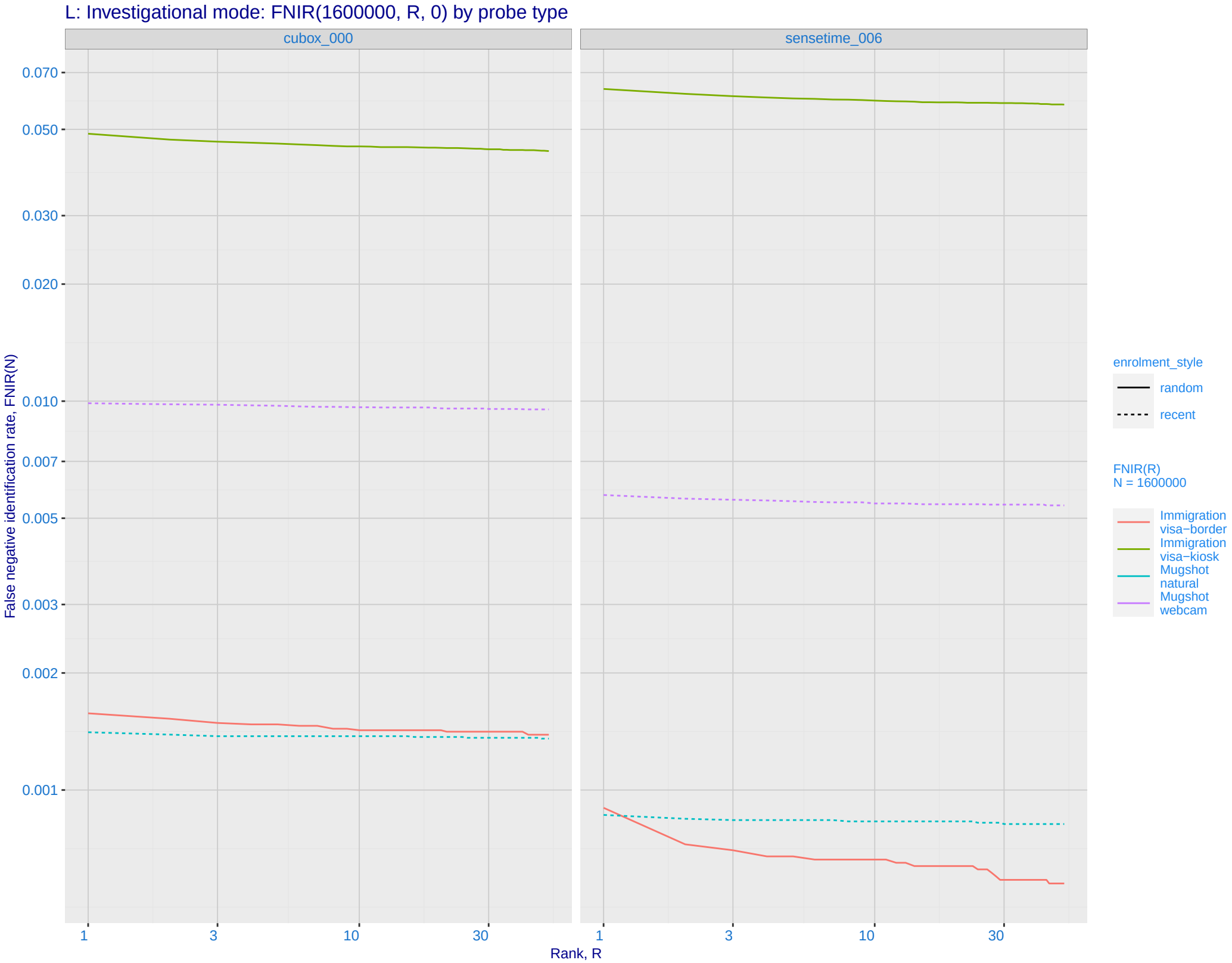



I: FNIR and FPIR dependence on threshold
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
FNIR(T)
0.400
0.200
0.100
0.040
0.020
0.010
0.004
0.002
FPIR(T)
1e+00
4e−01
2e−01
1e−01
4e−02
2e−02
1e−02
4e−03
2e−03
1e−03
4e−04
2e−04
1e−04
False {Negative | Positive} Identification Rate
1.2
1.3
1.4
1.5
1.6
Threshold value

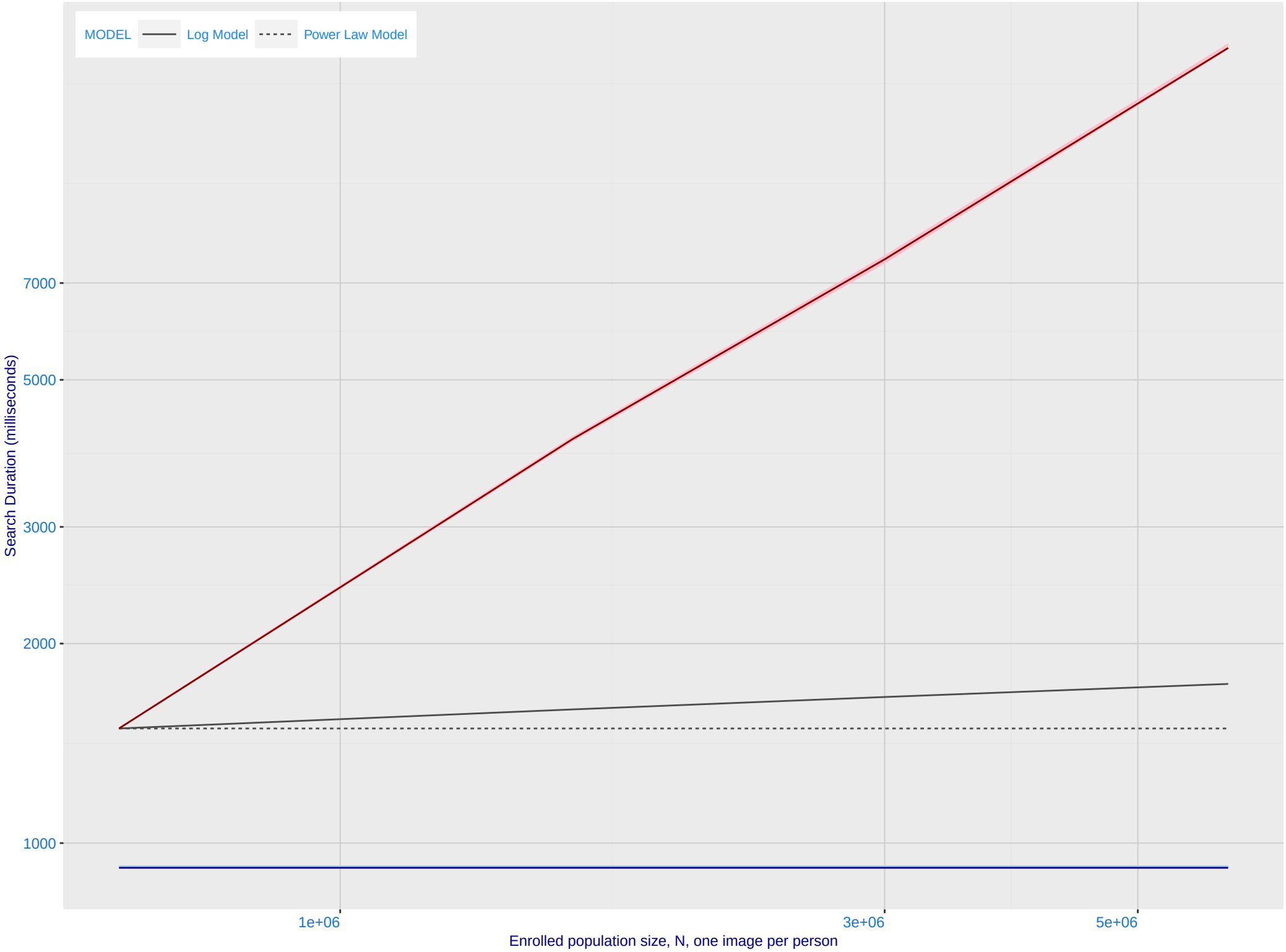
J: DET for Mugshot natural images and various N. Links connect points of equal threshold.



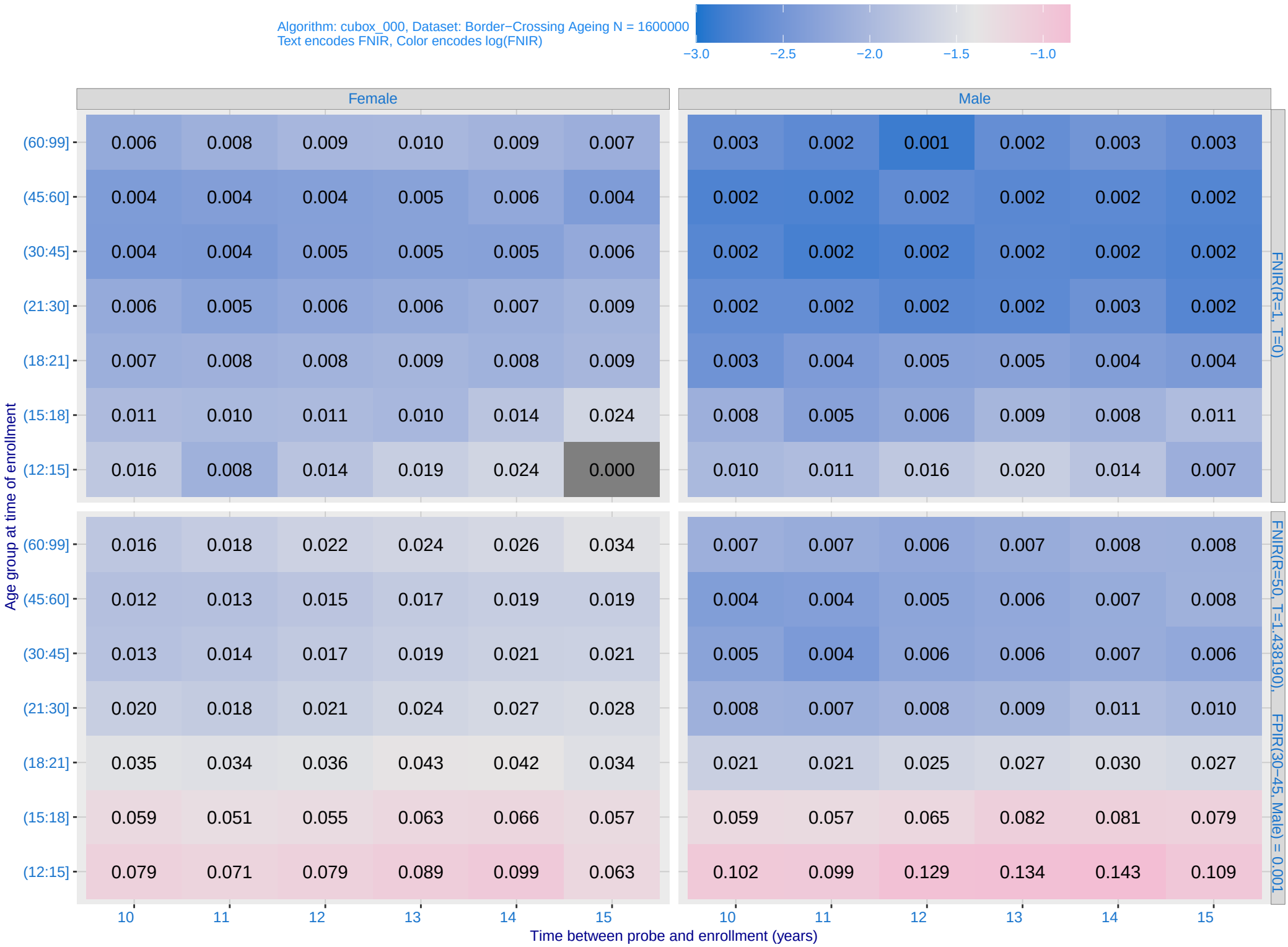

K: Investigational mode: FNIR(N, 1, 0) vs. most accurate (sensetime_006)
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam
False negative identification rate, FNIR(N)
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e+06
3e+06
1e+07
Enrolled population size, N
FNIR@Rank = 1
cubox_000
sensetime_006
enrolment_style
random
recent


L: Investigational mode: FNIR(1600000, R, 0) by probe type
cubox_000
sensetime_006
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

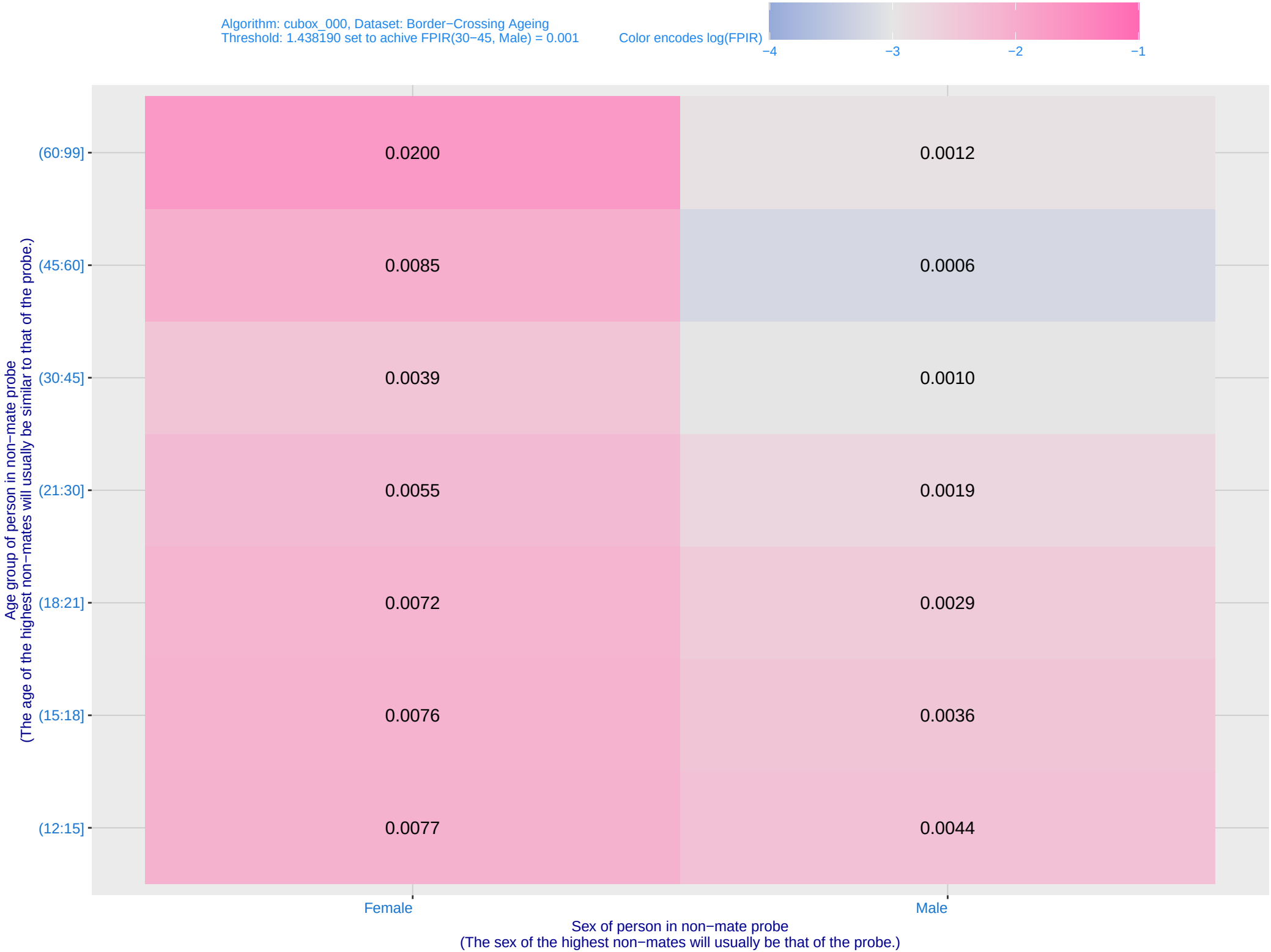
M: Template duration; search duration vs. N. The blue and pink ribbon covers 95 percent of observed measurements.
The template generation time is independent of N. The log and power−law models are fit to the first two (N,T) observations

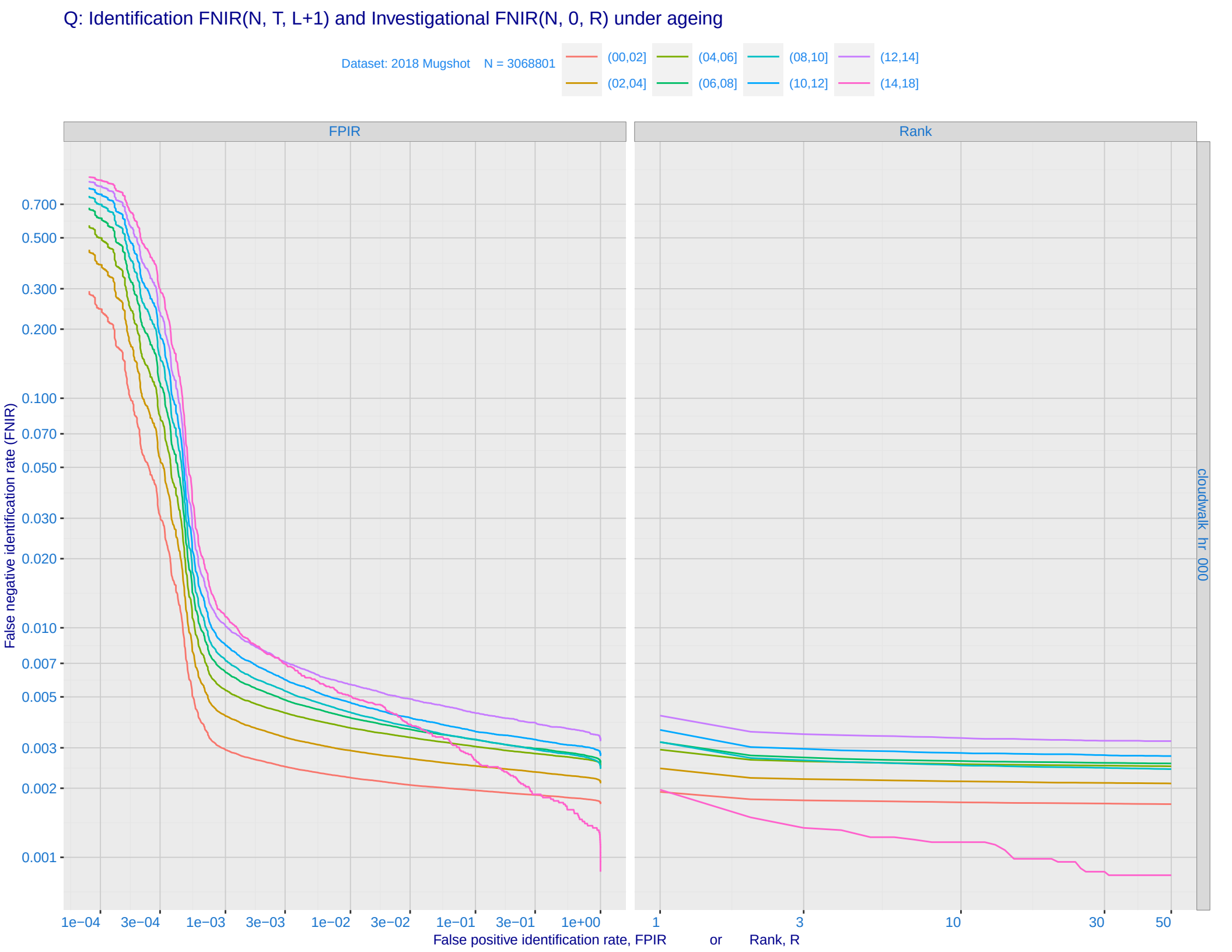


O: FNIR(T, N = 1.6 million) by sex, age and time−lapse. The top row gives investigational rank−1 miss rates.
The bottom panels give high threshold for more lights−out identification with low FPIR.



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
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