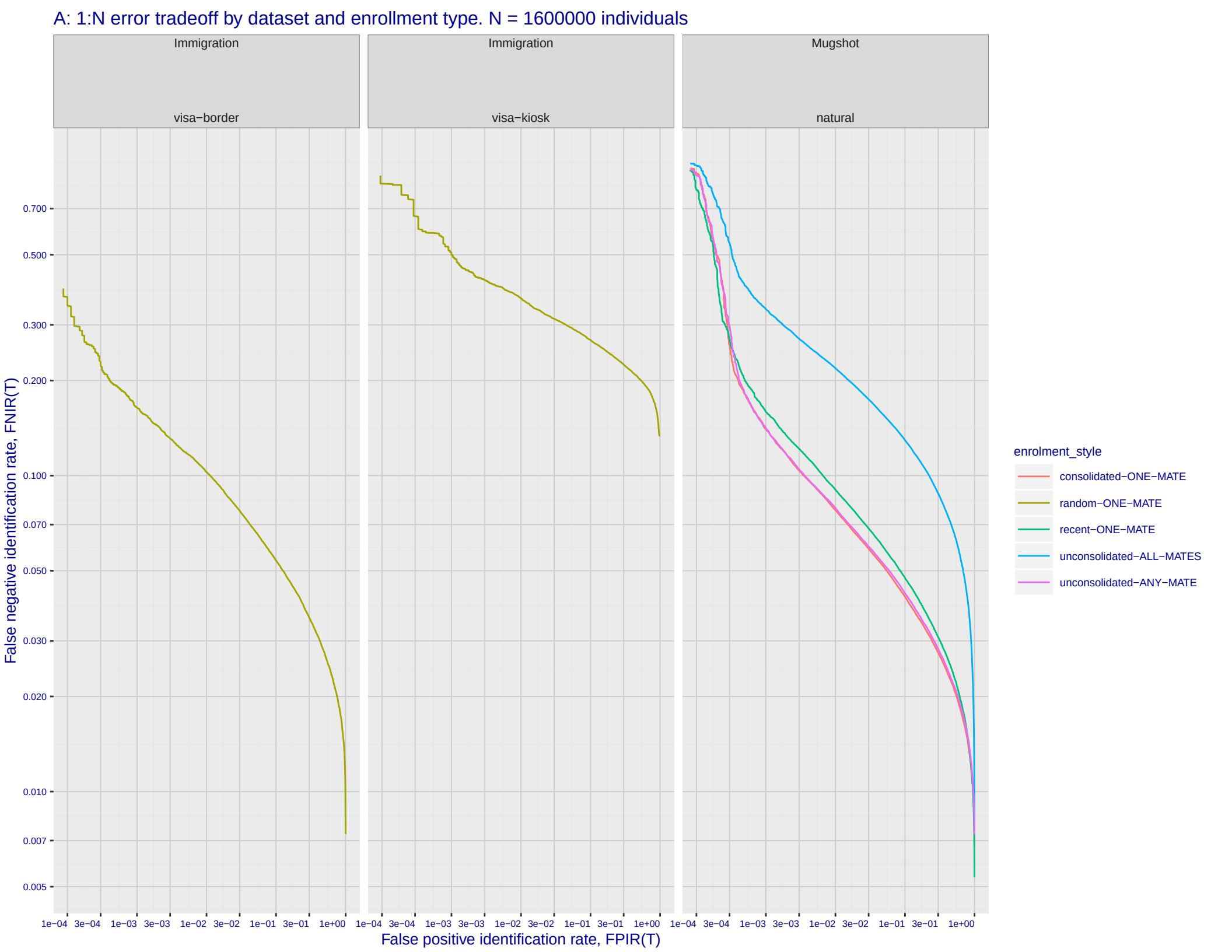
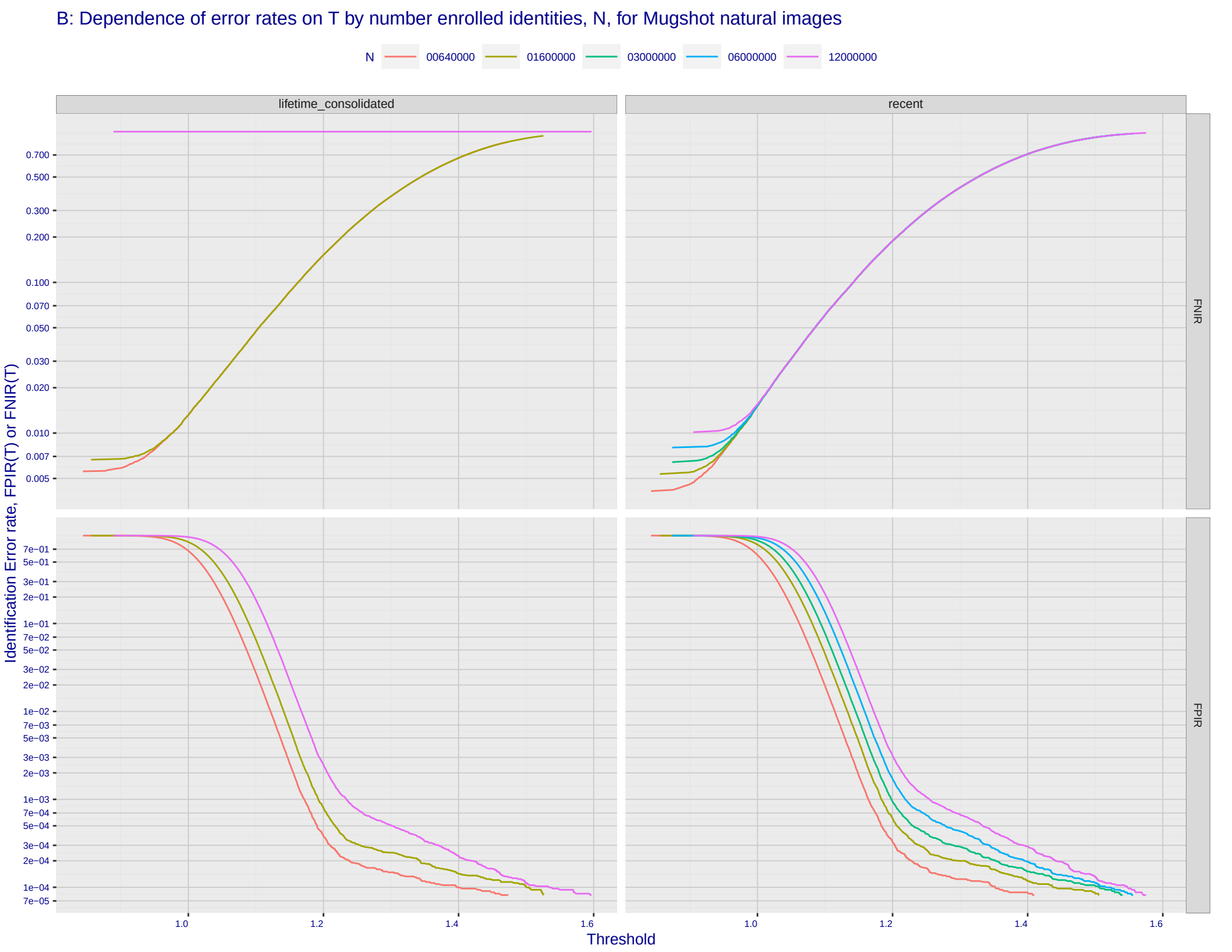
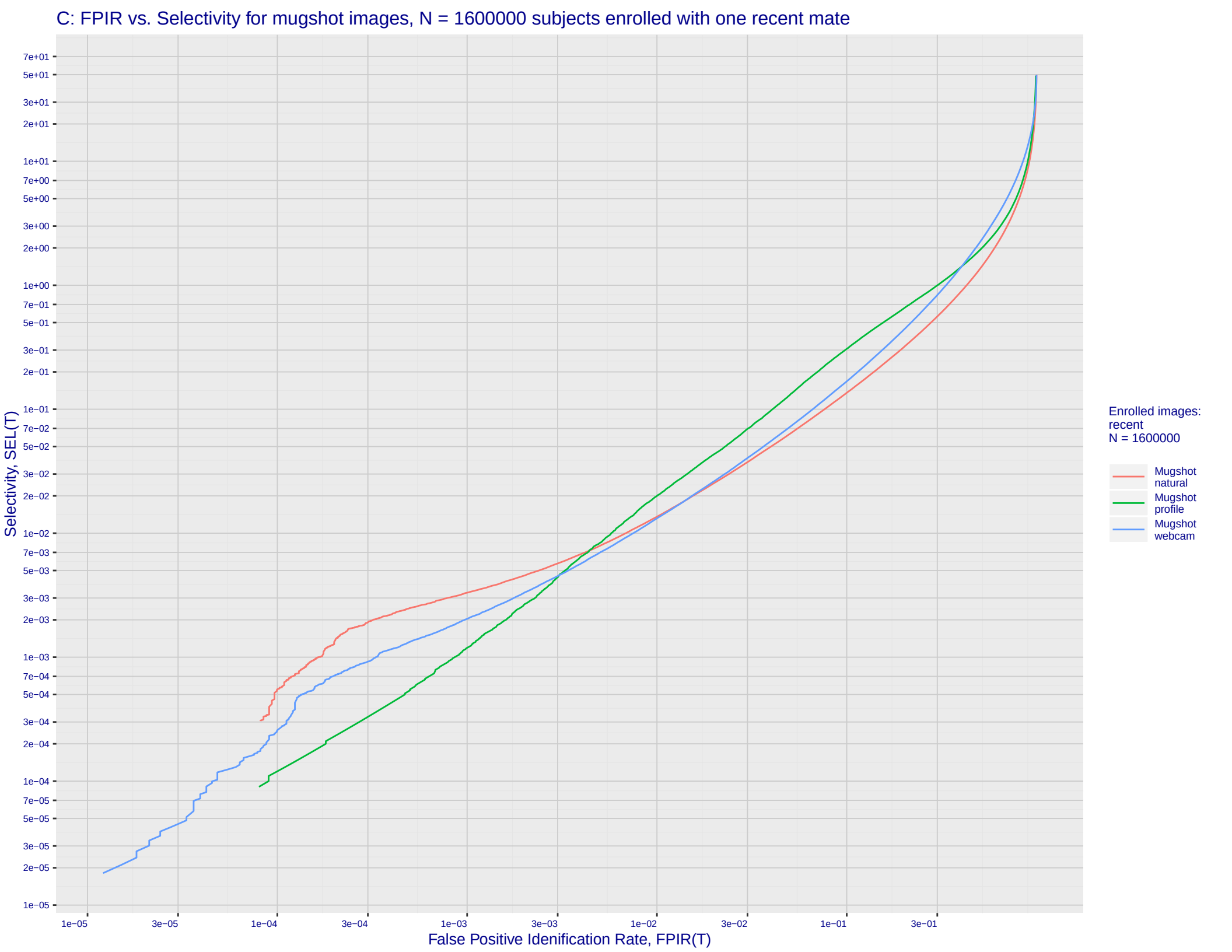
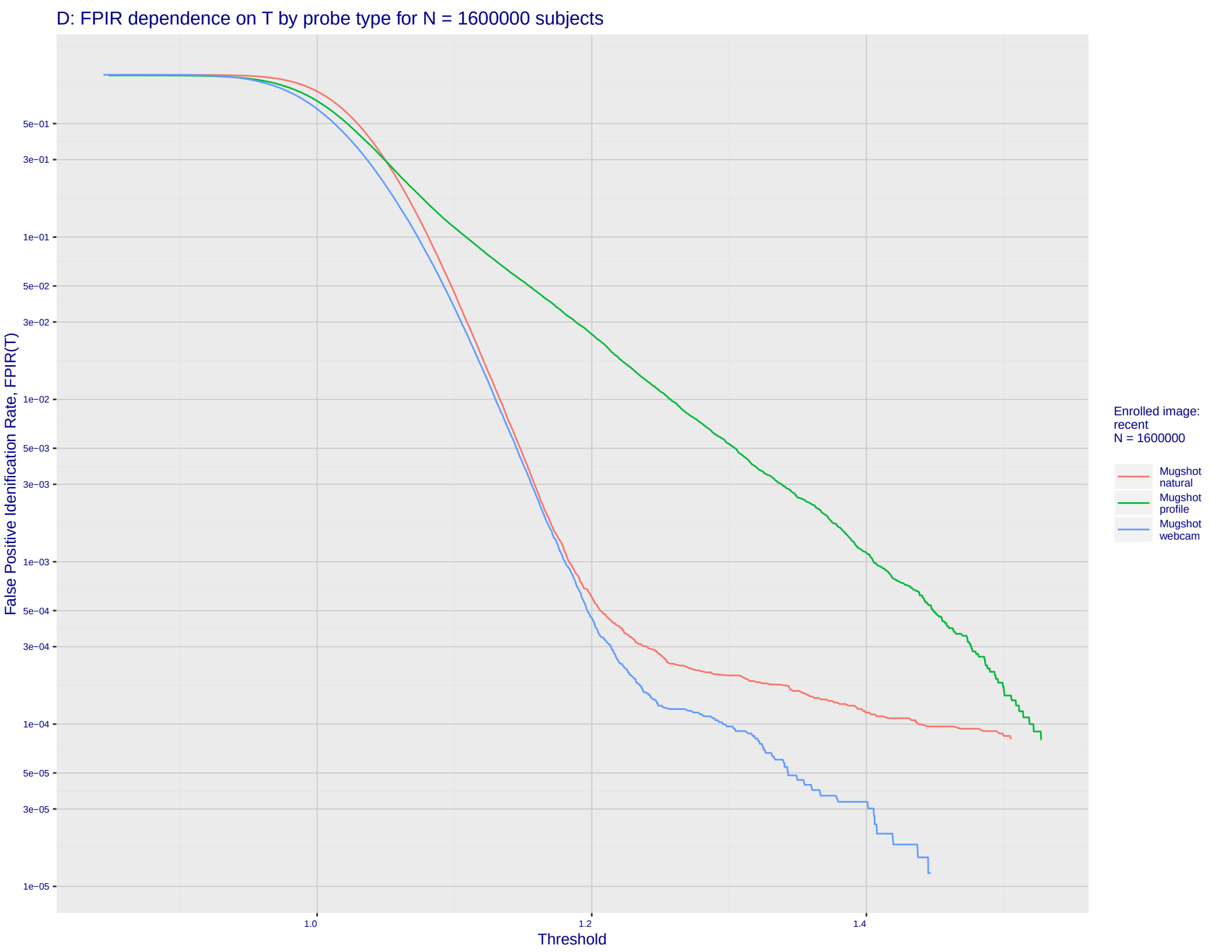
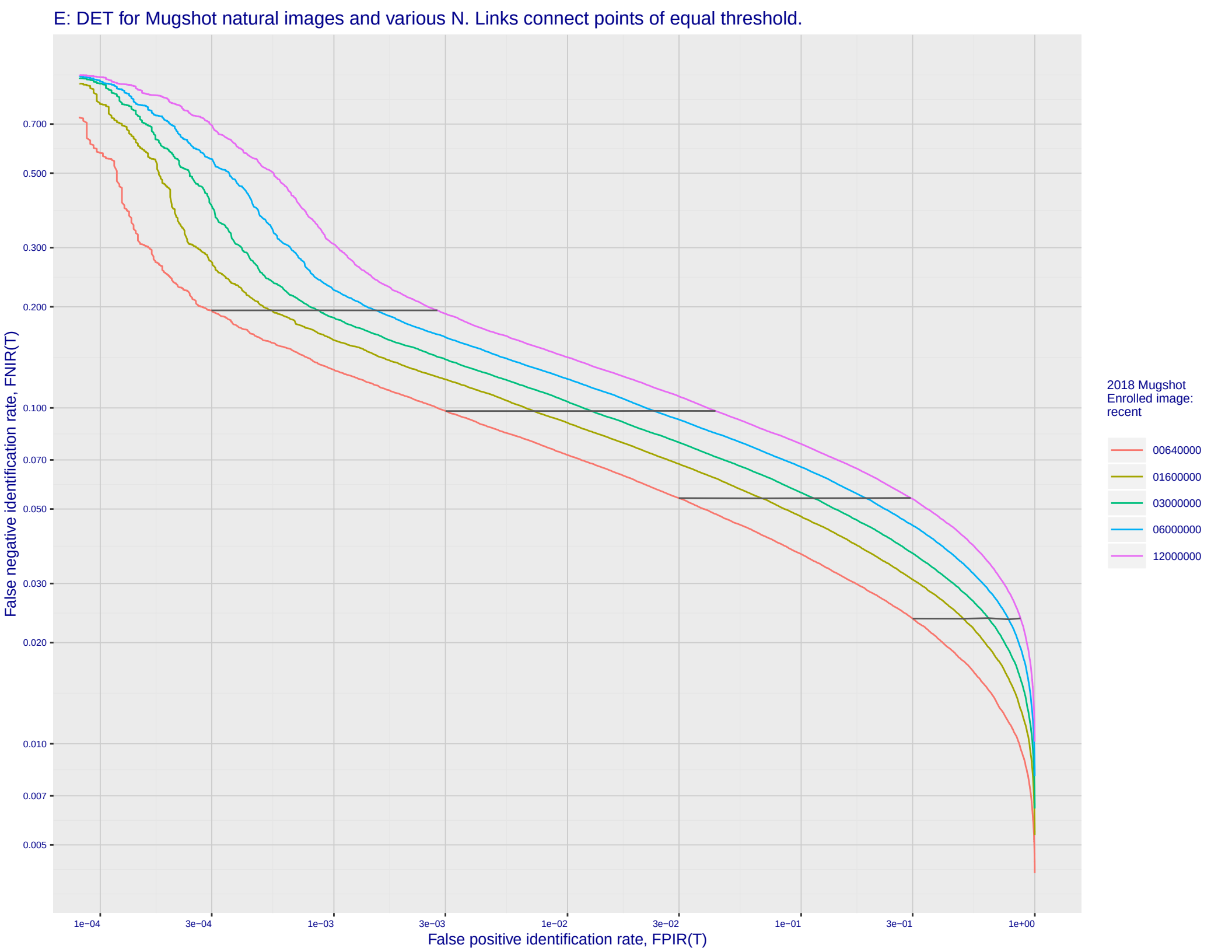
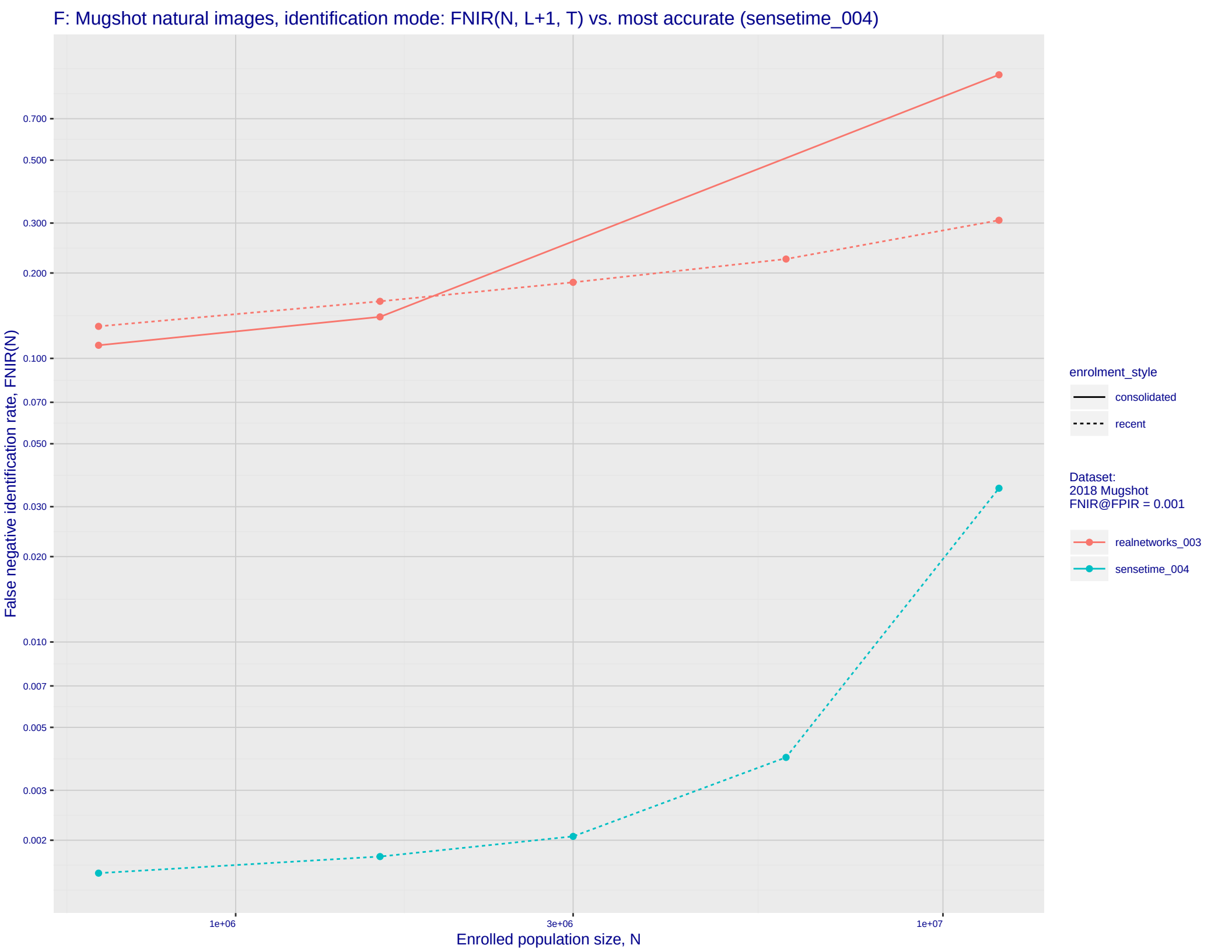

A: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration
visa−border
Immigration
visa−kiosk
Mugshot
natural
False negative identification rate, FNIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
1e−04 3e−04 1e−03 3e−03 1e−02 3e−02 1e−01 3e−01 1e+00
False positive identification rate, FPIR(T)
enrolment_style
consolidated−ONE−MATE
random−ONE−MATE
recent−ONE−MATE
unconsolidated−ALL−MATES
unconsolidated−ANY−MATE


B: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images
N
00640000
01600000
03000000
06000000
12000000
lifetime_consolidated
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
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
1.0
1.2
1.4
1.6


C: 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
profile
Mugshot
webcam


D: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Idenification Rate, FPIR(T)
5e−01
3e−01
1e−01
5e−02
3e−02
1e−02
5e−03
3e−03
1e−03
5e−04
3e−04
1e−04
5e−05
3e−05
1e−05
1.0
1.2
1.4
Threshold
Enrolled image:
recent
N = 1600000
Mugshot
natural
Mugshot
profile
Mugshot
webcam


E: 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
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


F: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (sensetime_004)
False negative identification rate, FNIR(N)
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+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
consolidated
recent
Dataset:
2018 Mugshot
FNIR@FPIR = 0.001
realnetworks_003
sensetime_004

G: Datasheet

Algorithm: realnetworks_003

Developer: Realnetworks Inc

Submission Date: 2019_06_12

Template size: 1848 bytes

Template time (2.5 percentile): 168 msec

Template time (median): 174 msec

Template time (97.5 percentile): 202 msec

Frontal mugshot investigation rank 161 −− FNIR(1600000, 0, 1) = 0.0242 vs. lowest 0.0010 from sensetime_004

natural investigation rank 143 −− FNIR(1600000, 0, 1) = 0.0615 vs. lowest 0.0067 from sensetime_003

natural investigation rank 111 −− FNIR(1600000, 0, 1) = 0.5382 vs. lowest 0.0492 from paravision_005

natural investigation rank 111 −− FNIR(1600000, 0, 1) = 0.5382 vs. lowest 0.0492 from paravision_005

natural investigation rank 67 −− FNIR(1600000, 0, 1) = 0.0313 vs. lowest 0.0014 from visionlabs_009

natural investigation rank 61 −− FNIR(1600000, 0, 1) = 0.2091 vs. lowest 0.0694 from cib_000

Frontal mugshot identification rank 148 −− FNIR(1600000, T, L+1) = 0.1589 vs. lowest 0.0018 from sensetime_004

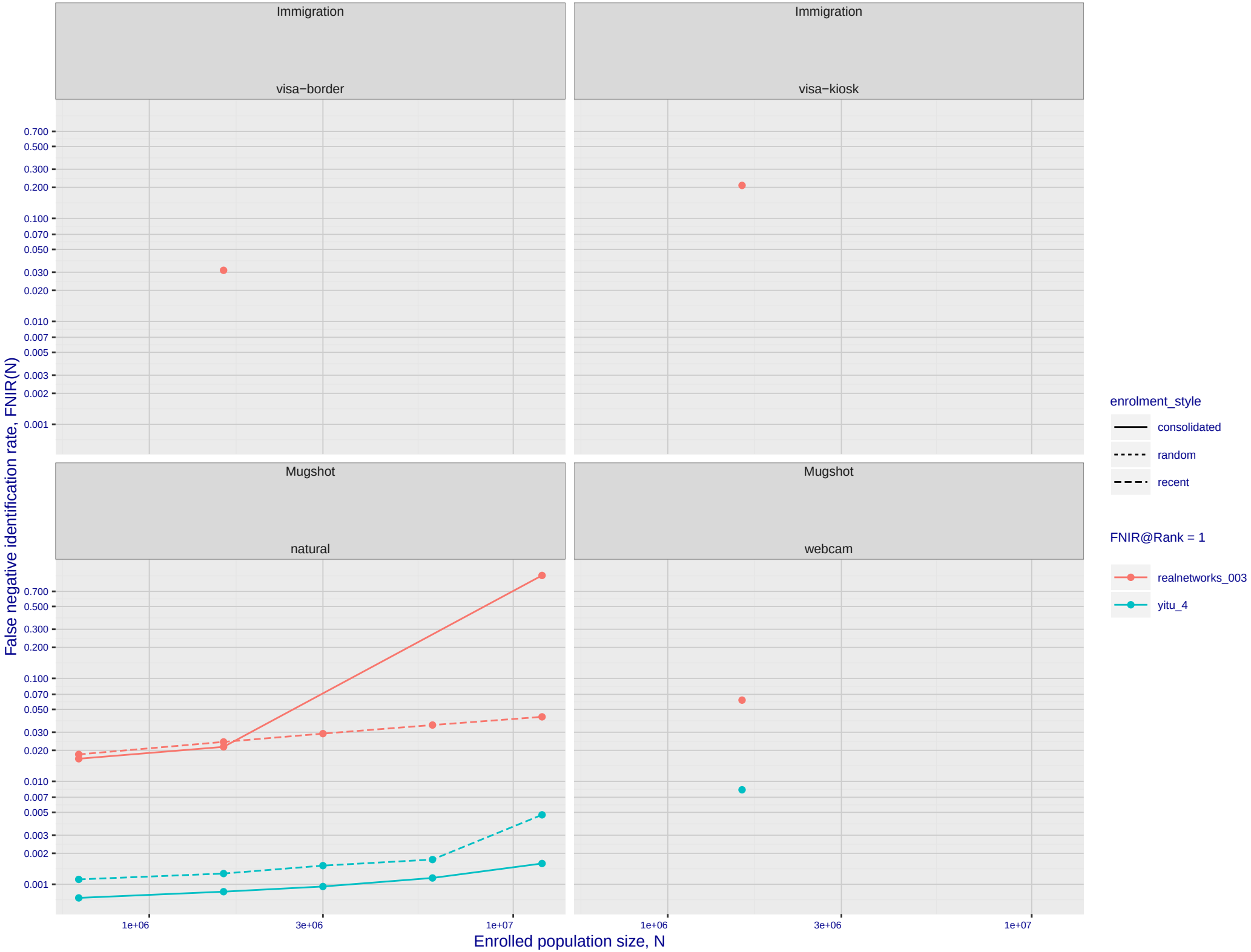
natural identification rank 135 −− FNIR(1600000, T, L+1) = 0.2658 vs. lowest 0.0122 from sensetime_003

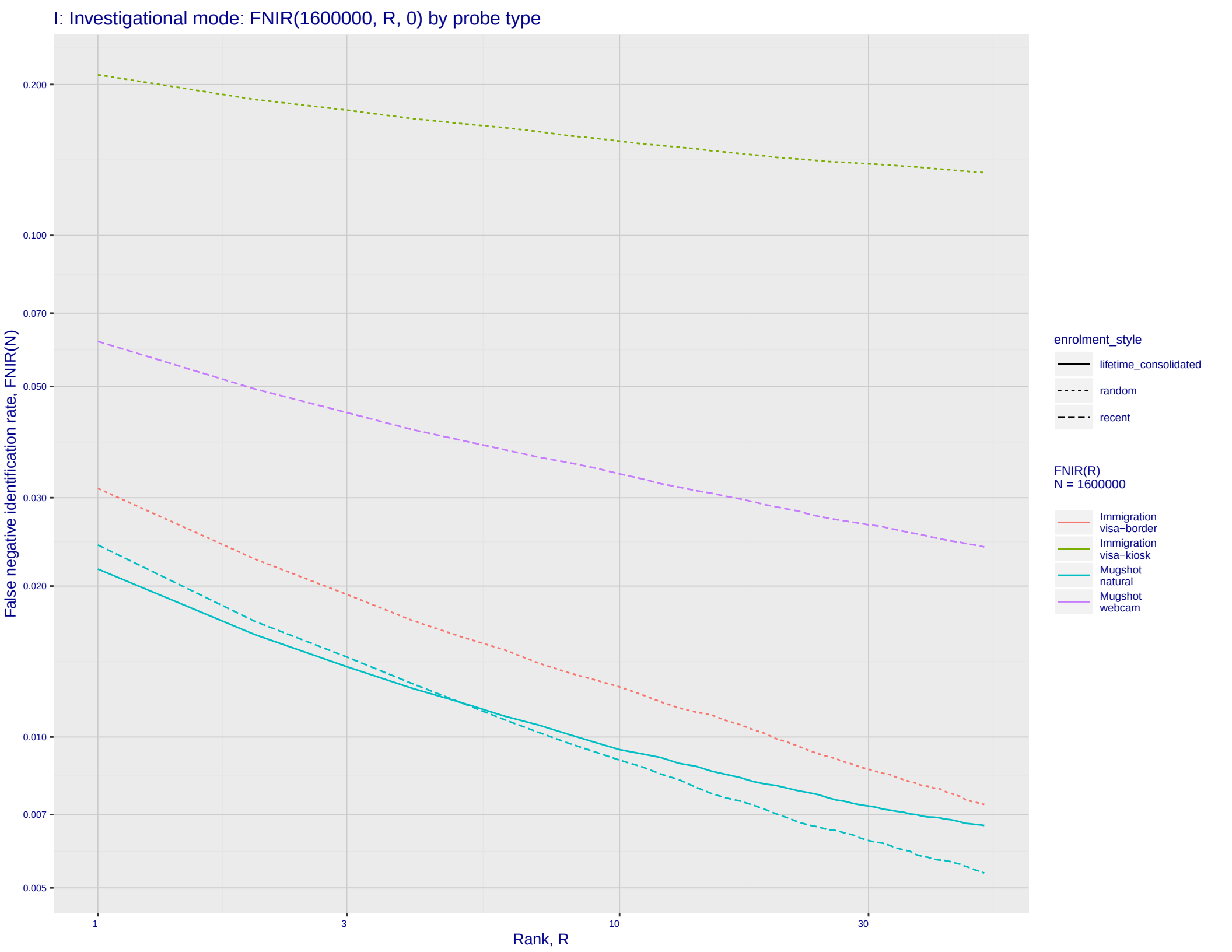
natural identification rank 94 −− FNIR(1600000, T, L+1) = 0.9930 vs. lowest 0.1020 from sensetime_004

natural identification rank 61 −− FNIR(1600000, T, L+1) = 0.1641 vs. lowest 0.0059 from sensetime_004

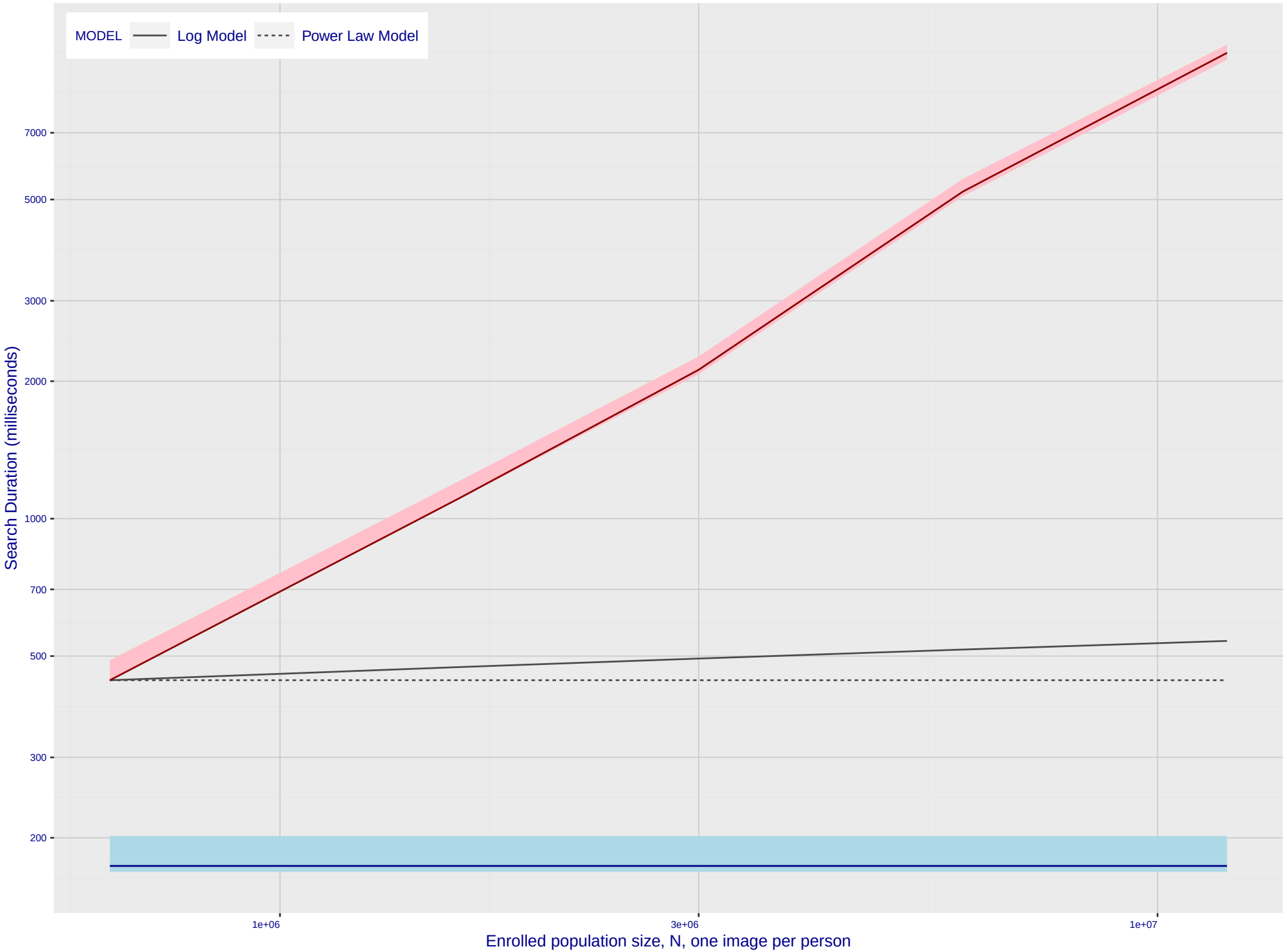
natural identification rank 50 −− FNIR(1600000, T, L+1) = 0.5086 vs. lowest 0.1129 from visionlabs_009

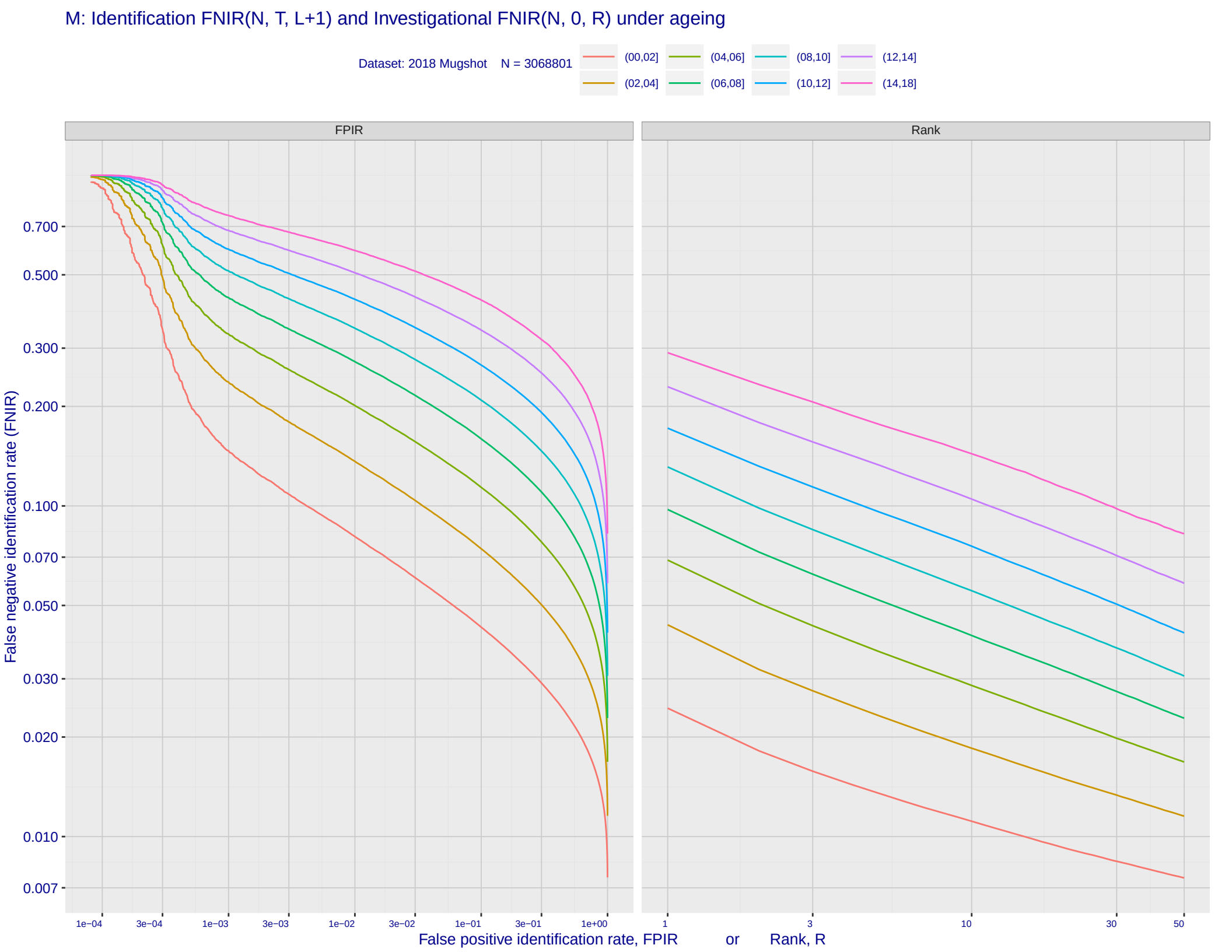
H: Investigational mode: FNIR(N, 1, 0) vs. most accurate (yitu_4)

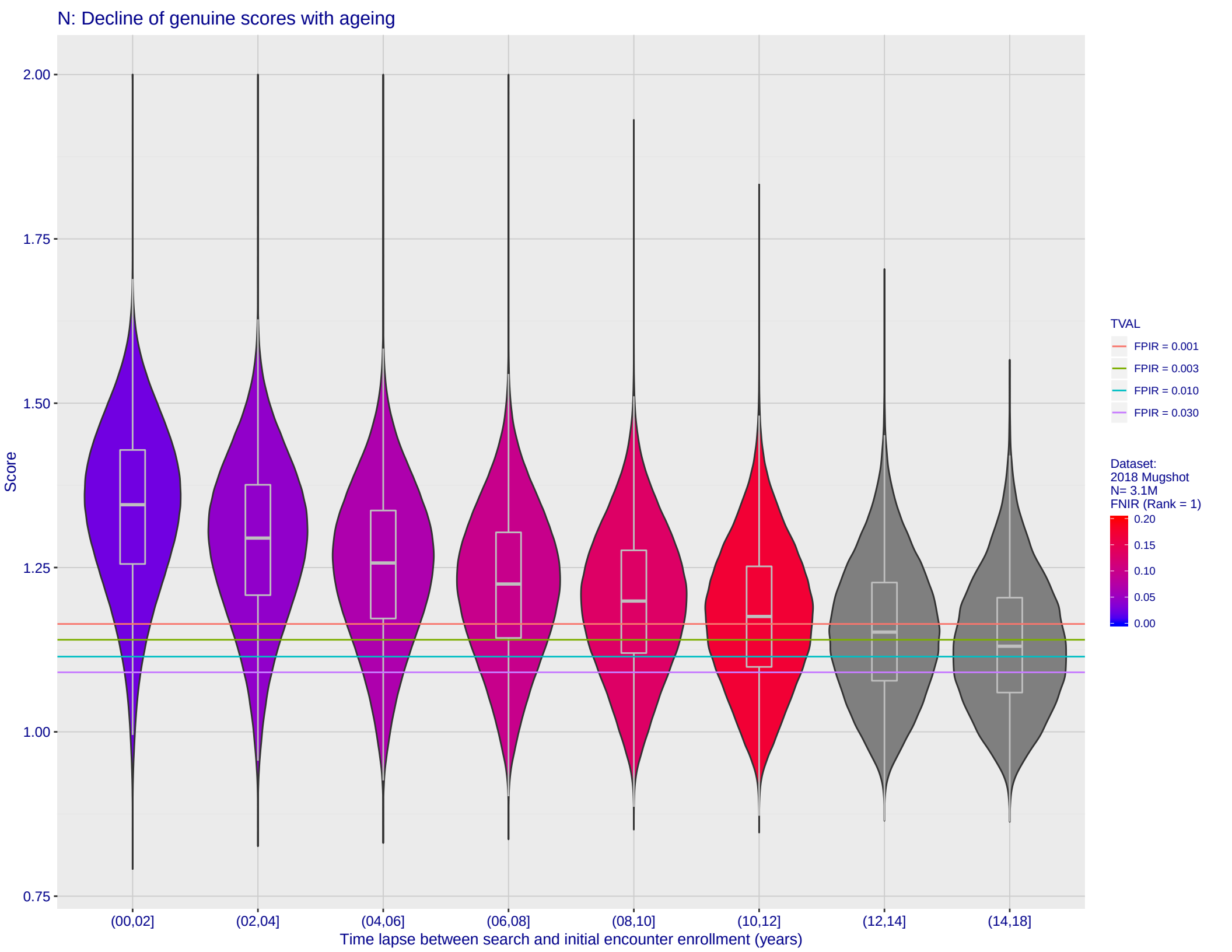



I: Investigational mode: FNIR(1600000, R, 0) by probe type
False negative identification rate, FNIR(N)
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
1
3
10
30
Rank, R
enrolment_style
lifetime_consolidated
random
recent
FNIR(R)
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam

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




M: 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
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


N: Decline of genuine scores with ageing
Score
2.00
1.75
1.50
1.25
1.00
0.75
(00,02]
(02,04]
(04,06]
(06,08]
(08,10]
(10,12]
(12,14]
(14,18]
Time lapse between search and initial encounter enrollment (years)
TVAL
FPIR = 0.001
FPIR = 0.003
FPIR = 0.010
FPIR = 0.030
Dataset:
2018 Mugshot
N= 3.1M
FNIR (Rank = 1)
0.20
0.15
0.10
0.05
0.00