

Supplementary material to:
“From HIV testing to ART initiation under fire: joinpoint regression analysis of regional disparities during the full-scale war against Ukraine”

Table S1. Facility-based HIV testing in Ukraine, 2020-2023, quarterly indicators, aggregated by exposure to active hostilities.

Quarter	Exposure to hostilities	Number of persons tested for HIV	Number of persons with confirmed positive test result	% positive	Ratio of newly registered cases to people with positive tests	Ratio of people initiating ART to newly registered cases
1	Active hostilities	215990	2216	1.03%	0.89	1.07
2	Active hostilities	171495	2013	1.17%	0.85	1.08
3	Active hostilities	189659	2240	1.18%	0.87	1.07
4	Active hostilities	187463	1758	0.94%	0.83	1.05
5	Active hostilities	184826	1973	1.07%	0.84	1.01
6	Active hostilities	185399	2077	1.12%	0.85	0.98
7	Active hostilities	142319	1912	1.34%	0.89	1.08
8	Active hostilities	176193	1632	0.93%	0.82	0.90
9	Active hostilities	96054	1094	1.14%	0.97	1.03
10	Active hostilities	89785	1186	1.32%	0.85	1.08
11	Active hostilities	124298	1660	1.34%	0.73	1.01
12	Active hostilities	158033	1278	0.81%	0.86	0.96
13	Active hostilities	158727	1441	0.91%	0.85	1.04
14	Active hostilities	173664	1640	0.94%	0.72	1.01
15	Active hostilities	157161	1147	0.73%	1.02	0.96
16	Active hostilities	176767	1241	0.70%	0.88	0.92
1	History of hostilities	163430	2308	1.41%	0.66	1.15
2	History of hostilities	91843	1477	1.61%	0.97	1.11
3	History of hostilities	126064	3039	2.41%	0.55	1.16
4	History of hostilities	148726	3045	2.05%	0.55	0.93
5	History of hostilities	151627	2240	1.48%	0.69	1.12
6	History of hostilities	131335	2025	1.54%	0.89	0.96
7	History of hostilities	160654	2101	1.31%	0.76	1.12
8	History of hostilities	144408	1993	1.38%	0.91	0.78
9	History of hostilities	88951	1304	1.47%	0.87	1.15
10	History of hostilities	116489	2038	1.75%	0.76	0.98
11	History of hostilities	150954	2273	1.51%	0.78	0.96
12	History of hostilities	181877	1147	0.63%	1.10	0.82
13	History of hostilities	153155	1360	0.89%	0.79	1.04
14	History of hostilities	165059	1240	0.75%	0.87	1.07
15	History of hostilities	171488	1302	0.76%	0.85	0.98
16	History of hostilities	236021	1512	0.64%	0.73	0.89
1	No hostilities	185162	934	0.50%	0.72	1.14
2	No hostilities	136259	628	0.46%	0.71	1.23
3	No hostilities	173646	776	0.45%	0.71	1.12
4	No hostilities	134944	671	0.50%	0.70	1.16

Quarter	Exposure to hostilities	Number of persons tested for HIV	Number of persons with confirmed positive test result	% positive	Ratio of newly registered cases to people with positive tests	Ratio of people initiating ART to newly registered cases
5	No hostilities	151397	767	0.51%	0.58	1.12
6	No hostilities	150335	613	0.41%	0.82	1.13
7	No hostilities	146919	719	0.49%	0.78	1.06
8	No hostilities	156283	819	0.52%	0.61	1.05
9	No hostilities	133148	572	0.43%	0.71	1.00
10	No hostilities	145691	900	0.62%	0.60	1.14
11	No hostilities	162386	691	0.43%	0.80	1.09
12	No hostilities	162843	778	0.48%	0.79	0.96
13	No hostilities	169517	878	0.52%	0.72	1.06
14	No hostilities	202806	721	0.36%	0.89	1.00
15	No hostilities	218545	852	0.39%	0.81	1.04
16	No hostilities	265109	837	0.32%	0.77	1.01
1	24 regions	564582	5458	0.97%	0.76	1.11
2	24 regions	399597	4118	1.03%	0.87	1.11
3	24 regions	489369	6055	1.24%	0.69	1.11
4	24 regions	471133	5474	1.16%	0.66	1.01
5	24 regions	487850	4980	1.02%	0.73	1.07
6	24 regions	467069	4715	1.01%	0.86	0.99
7	24 regions	449892	4732	1.05%	0.81	1.09
8	24 regions	476884	4444	0.93%	0.82	0.86
9	24 regions	318153	2970	0.93%	0.88	1.08
10	24 regions	351965	4124	1.17%	0.75	1.04
11	24 regions	437638	4624	1.06%	0.76	1.00
12	24 regions	502753	3203	0.64%	0.93	0.90
13	24 regions	481399	3679	0.76%	0.80	1.05
14	24 regions	541529	3601	0.66%	0.81	1.03
15	24 regions	547194	3301	0.60%	0.90	0.99
16	24 regions	677897	3590	0.53%	0.79	0.93

Exposure categories are based on official Ukrainian government classification [26]

Table S2. Number of newly registered HIV cases and ART initiation in Ukraine, 2020-2023, monthly indicators, aggregated by exposure to active hostilities.

Month	Exposure to hostilities	Number of newly registered HIV cases	Number of people initiating ART
1	Active hostilities	584	696
2	Active hostilities	778	759
3	Active hostilities	616	661
4	Active hostilities	522	577
5	Active hostilities	523	570
6	Active hostilities	673	712
7	Active hostilities	697	753
8	Active hostilities	609	621
9	Active hostilities	650	723
10	Active hostilities	456	485
11	Active hostilities	480	512
12	Active hostilities	524	541
13	Active hostilities	436	461
14	Active hostilities	635	603
15	Active hostilities	596	619
16	Active hostilities	602	617
17	Active hostilities	545	563
18	Active hostilities	621	554
19	Active hostilities	581	676
20	Active hostilities	571	568
21	Active hostilities	547	586
22	Active hostilities	364	403
23	Active hostilities	470	470
24	Active hostilities	508	339
25	Active hostilities	426	437
26	Active hostilities	332	405
27	Active hostilities	305	248
28	Active hostilities	297	315
29	Active hostilities	326	371
30	Active hostilities	383	405
31	Active hostilities	389	374
32	Active hostilities	390	435
33	Active hostilities	426	408
34	Active hostilities	319	342
35	Active hostilities	385	372
36	Active hostilities	393	339
37	Active hostilities	409	428
38	Active hostilities	392	412
39	Active hostilities	424	438
40	Active hostilities	360	369
41	Active hostilities	386	400
42	Active hostilities	437	426
43	Active hostilities	395	382
44	Active hostilities	391	405

Month	Exposure to hostilities	Number of newly registered HIV cases	Number of people initiating ART
45	Active hostilities	388	343
46	Active hostilities	345	365
47	Active hostilities	354	357
48	Active hostilities	399	292
1	History of hostilities	464	524
2	History of hostilities	541	602
3	History of hostilities	517	618
4	History of hostilities	400	500
5	History of hostilities	430	493
6	History of hostilities	605	607
7	History of hostilities	457	601
8	History of hostilities	575	617
9	History of hostilities	629	713
10	History of hostilities	653	547
11	History of hostilities	467	506
12	History of hostilities	547	500
13	History of hostilities	434	505
14	History of hostilities	608	611
15	History of hostilities	501	610
16	History of hostilities	570	600
17	History of hostilities	724	549
18	History of hostilities	512	593
19	History of hostilities	609	655
20	History of hostilities	506	578
21	History of hostilities	478	551
22	History of hostilities	458	484
23	History of hostilities	706	560
24	History of hostilities	640	364
25	History of hostilities	448	492
26	History of hostilities	373	482
27	History of hostilities	319	335
28	History of hostilities	387	422
29	History of hostilities	517	511
30	History of hostilities	647	581
31	History of hostilities	584	570
32	History of hostilities	582	584
33	History of hostilities	604	541
34	History of hostilities	459	354
35	History of hostilities	403	311
36	History of hostilities	395	364
37	History of hostilities	321	318
38	History of hostilities	338	388
39	History of hostilities	418	413
40	History of hostilities	334	360
41	History of hostilities	370	411
42	History of hostilities	372	376

Month	Exposure to hostilities	Number of newly registered HIV cases	Number of people initiating ART
43	History of hostilities	321	340
44	History of hostilities	420	390
45	History of hostilities	368	354
46	History of hostilities	404	350
47	History of hostilities	380	334
48	History of hostilities	321	304
1	No hostilities	214	275
2	No hostilities	256	265
3	No hostilities	201	226
4	No hostilities	125	173
5	No hostilities	140	148
6	No hostilities	182	228
7	No hostilities	188	222
8	No hostilities	138	179
9	No hostilities	223	214
10	No hostilities	127	153
11	No hostilities	154	199
12	No hostilities	190	193
13	No hostilities	117	129
14	No hostilities	140	170
15	No hostilities	186	197
16	No hostilities	161	187
17	No hostilities	162	164
18	No hostilities	177	213
19	No hostilities	212	197
20	No hostilities	161	194
21	No hostilities	189	202
22	No hostilities	111	154
23	No hostilities	191	160
24	No hostilities	195	208
25	No hostilities	106	120
26	No hostilities	145	144
27	No hostilities	156	144
28	No hostilities	154	190
29	No hostilities	194	217
30	No hostilities	189	205
31	No hostilities	193	207
32	No hostilities	180	213
33	No hostilities	178	179
34	No hostilities	220	171
35	No hostilities	171	212
36	No hostilities	226	208
37	No hostilities	189	199
38	No hostilities	240	257
39	No hostilities	200	212
40	No hostilities	184	192

Month	Exposure to hostilities	Number of newly registered HIV cases	Number of people initiating ART
41	No hostilities	210	214
42	No hostilities	250	235
43	No hostilities	224	248
44	No hostilities	219	226
45	No hostilities	247	244
46	No hostilities	211	230
47	No hostilities	214	223
48	No hostilities	222	201
1	24 regions	1262	1495
2	24 regions	1575	1626
3	24 regions	1334	1505
4	24 regions	1047	1250
5	24 regions	1093	1211
6	24 regions	1460	1547
7	24 regions	1342	1576
8	24 regions	1322	1417
9	24 regions	1502	1650
10	24 regions	1236	1185
11	24 regions	1101	1217
12	24 regions	1261	1234
13	24 regions	987	1095
14	24 regions	1383	1384
15	24 regions	1283	1426
16	24 regions	1333	1404
17	24 regions	1431	1276
18	24 regions	1310	1360
19	24 regions	1402	1528
20	24 regions	1238	1340
21	24 regions	1214	1339
22	24 regions	933	1041
23	24 regions	1367	1190
24	24 regions	1343	911
25	24 regions	980	1049
26	24 regions	850	1031
27	24 regions	780	727
28	24 regions	838	927
29	24 regions	1037	1099
30	24 regions	1219	1191
31	24 regions	1166	1151
32	24 regions	1152	1232
33	24 regions	1208	1128
34	24 regions	998	867
35	24 regions	959	895
36	24 regions	1014	911
37	24 regions	919	945
38	24 regions	970	1057

Month	Exposure to hostilities	Number of newly registered HIV cases	Number of people initiating ART
39	24 regions	1042	1063
40	24 regions	878	921
41	24 regions	966	1025
42	24 regions	1059	1037
43	24 regions	940	970
44	24 regions	1030	1021
45	24 regions	1003	941
46	24 regions	960	945
47	24 regions	948	914
48	24 regions	942	797

Exposure categories are based on official Ukrainian government classification [26]. The number of people initiating ART is not restricted to persons newly registered in the same month. This indicator includes people first initiated on ART during the reporting month, regardless of whether HIV case registration occurred in the same or an earlier period. Therefore, monthly ART initiation counts may exceed monthly counts of newly registered HIV cases.

Table S3. Joinpoint regression settings used in the analyses

Parameter	Quarterly analyses	Monthly analyses
Software	Joinpoint Regression Program, National Cancer Institute, USA, v5.4.0	Joinpoint Regression Program, National Cancer Institute, USA, v5.4.0
Outcomes analyzed	Number of persons tested for HIV infection in healthcare facilities; number of persons with confirmed positive HIV serological results; test positivity	Number of newly registered HIV cases; number of people initiating ART
Time interval	Quarter	Month
Input data structure	Region-level data aggregated by hostilities-exposure group for each reporting period	Region-level data aggregated by hostilities-exposure group for each reporting period
Dependent variable type	Counts for testing and confirmed positive results; percent for test positivity	Counts
Model form	Log-linear, log scale	Log-linear, log scale
Variance option	Constant variance (homoscedasticity)	Constant variance (homoscedasticity)
Errors model / autocorrelation	Uncorrelated errors; no autocorrelation correction applied	Uncorrelated errors; no autocorrelation correction applied
Zero values in analyzed series	No zero values present	No zero values present
Joinpoint search method	Grid search	Grid search
Minimum number of joinpoints allowed	0	0
Maximum number of joinpoints allowed	2	5
Minimum observations from joinpoint to end of series	2	2
Minimum observations between two joinpoints	2	2
Points between adjacent observed x-values	0	0
Model selection method	Permutation test	Permutation test
Overall significance level for permutation tests	0.0500	0.0500
Summary measures reported	QPC and AQPC with 95% CI	MPC and AMPC with 95% CI
Criterion for statistical significance	95% CI for QPC excluding zero	95% CI for MPC excluding zero