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Effects of Forced Displacement on Health

by

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Working Paper No. 1508

September 2015

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Abstract

This paper analyzes health consequences of forced civilian displacement that occurred during the war in Croatia 1991-1995 which accompanied the demise of Yugoslavia. Using the Croatian Adult Health Survey 2003 we test whether displacement is relevant in explaining various dimensions of measured and self-assessed health. We adopt an instrumental variable approach where civilian casualties per county are used as an instrument for displacement. We find robust significant adverse effects on self-assessed health, on probability of suffering from systolic and diastolic hypertension, and on mental health and role emotional SF-36 dimensions. We also address possible channels of adverse effect, and find that displacement did not induce a change in healthy behaviors, and that the negative effect of displacement is channeled through adverse economic conditions that the displaced individuals face.

Keywords: conflict, migration, health.
JEL classification: I10, O12, O15.

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1 Introduction

Armed conflicts, along with other dreadful consequences, cause mass civilian displacement. Individuals are forced to leave their homes due to immanent life threatening situations that cause a series of challenges, life changes and losses. According to the official UNHCR data, by the end of 2014 the number of forcefully displaced individuals was 59.5 million. In order to motivate policy that mitigates challenges and adverse conditions that the displaced people face, it is necessary to evaluate the effects of displacement on individuals. Indeed, the literature on consequences of displacement, economic as well as medical, is gaining momentum as micro data sets become more available.

This paper contributes to this literature by analyzing health effects of civil displacement during the war in Croatia 1991-1995, which was a part of larger-scale conflicts in the 1990s that accompanied the break up of Yugoslavia. During the Serbo-Croatian conflict a quarter of Croatian territory was ceded, 22,000 people were killed, and more than 500,000 individuals were displaced, more than 10% of Croatia's pre-war population.

While health consequences of this conflict are an important issue on its own, analyzing displacement caused by this conflict may provide broader implications. This war was set in a moderately developed country, very close to Central Europe. In particular, Croatia's GDP per capita in 1990 was 8,123 international 1990 dollars (Bolt and Zanden, 2014), while the distance from Croatia's capital, Zagreb, to Vienna and Munich is less than 400 and 600 km, respectively.

Therefore, civilian displacement during the war in Croatia was different than war-induced migration in a developing country. During displacement, most of the people in Croatia were settled to private accommodation (Global IDP Database, 2004), and the incidence of communicable diseases, neonatal health problems, and nutritional deficiencies, although increased, was not the most important cause of death (Toole and Waldman, 1997). Therefore, analyzing health consequences of mass civilian migration in a more affluent country can offer valuable information to other situations that create mass displacement, such as natural disasters, global warming and big infrastructure projects (Sarvimäki et al., 2009).

In this paper, using the Croatian Adult Health Survey collected in 2003, we analyze the effects of war migration on various dimensions of the health of females, including measured and self-assessed health. The timing of data collection coincides with the return of the largest number of displaced Croatians thus enabling us to analyze health consequences shortly upon the return to home.

Due to the potential endogeneity of displacement status, we adopt an IV approach. Displacement, although to a great extent a forced action, is partly a result of a decision. Also, observed patterns of migration during the war in Croatia, in particular, partial flight of population from war-inflicted areas and displacement of individuals who lived far from conflict, stress potential endogeneity. Given that we have limited pre-war individual characteristics, we find the assumption that displaced individuals and stayers do not differ in observed and unobserved characteristics too restrictive. Instead, relying on the ethnic pattern of conflict, which is orthogonal to pre-war health or health-related variables, we use civilian casualties across counties as an instrument for displacement status, like in Kondylis (2010). To the best of our knowledge, this is the first analysis of health effects of displacement that accounted for selection into displacement.

We find robust evidence that various health dimensions for females are adversely affected by displacement. In particular, we find that being displaced increases the probability of self-assessing one's health as not good and that it increases the probability of suffering from systolic and diastolic hypertension. Also, it significantly reduces mental health part of SF-36 outcomes, especially role emotional and mental health. These results hold for numerous robustness checks including inclusion of different geographical regions, different inference procedures as well as relaxing the exclusion restriction assumption by using methods from Conley et al. (2012).

In order to asses possible channels of adverse effects for females, we also analyze the effect of displacement on health-related variables. We test whether displacement induced any change in healthy behaviors by analyzing effect on eating, drinking and smoking habits, as well as on physical activity, labor activity, household income and marriage status. We do not find robust and significant effects on healthy behaviors, nor on marriage status and labor activity. However, we do find that displacement leads to higher probability of reporting one's household income below average. This reinforces the results of Fiala (2012) and Abdel Rahim et al. (2013) that displaced individuals are, due to dispossession, facing adverse economic conditions.

The literature on economics of forced migration is still in its early stage and it is gaining momentum as the micro data sets on war-inflicted areas become available. Ruiz and Vargas-Silva (2013) provide the overview of the literature on the effect of displacement on migrating individuals as well as on hosting communities. Although numerous papers show that displacement impacts negatively the economic perspective of an individual,[1] Sarvimäki et al. (2009) show that

[1]For example, Kondylis (2010), analyzing post-war Bosnia, shows that displaced males are more likely to be unemployed, while displaced females are more likely to drop out of labor force. Eder (2014), also using post-war Bosnia, shows that displaced individuals invest less on their children education. Bauer et al. (2013), analyzing

displacement might even induce higher mobility and consequently higher long-run incomes. In the health literature on displacement, there is a consensus that displacement adversely affects the health of individuals.[2] For example, Porter and Haslam (2001) provide a meta analysis of papers that analyze psychological consequences of war displacement caused by the demise of former Yugoslavia, all of which find mental health impairment of displaced and refugee persons. Similar results are also found on the displaced population in other war-inflicted areas, see Steel et al. (2002) and Kuwert et al. (2009). Thomas and Thomas (2004) analyzing key issues of displaced and refugee groups find that most common psychological consequences among those groups include Post Traumatic Stress Disorder (PTSD), depression, somatization and existential dilemmas.

The rest of the paper is organized as follows: section 2 provides background on war and displacement in Croatia, section 3 explains the data set used, section 4 presents the empirical strategy and discusses the identifying assumptions, section 5 gives results, relaxes the exclusion restriction and assesses the channels of adverse effects while section 6 concludes.

2 War and displacement in Croatia

War in Croatia 1991-1995 was part of a larger scale of conflicts on the territory of former Socialist Federative Republic of Yugoslavia (SFRY) in the 1990s. While the political tensions between Croatia and the leadership of SFRY were apparent already in the 1970s and 1980s, the large-scale armed conflict escalated after Croatia's declaration of independence in June 1991. By the end of 1991 rebel Serbian forces, with the support of Yugoslav People's Army (YPA), controlled by Serbia, declared the unified Republic of Srpska Krajina, taking a quarter of Croatian territory. In 1992 YPA had withdrawn and the United Nations Protective Force (UNPROFOR), as a part of peacekeeping mission, deployed the Serb held territories. In the mid-1995 Croatian army engaged in two large-scale military operations Storm and Flash and reclaimed most of its occupied territory excluding the Eastern part of Slavonia, Baranja and the Western Sirmium which was reintegrated in 1998 under the mandate of the UN Transitional Authority for Eastern Slavonia, Baranja and Western Sirmium (UNATES).

the integration of Germans from Eastern Europe, conclude that the first generation of migrants has lower incomes and ownership rates. Fiala (2012), analyzing the displacement in Uganda, concludes that displaced households that returned had a significant drop in consumption and decline in assets. Abdel Rahim et al. (2013), studying displacement in Nuba Mountains in Sudan, conclude that displaced households hold fewer assets and are less involved in production.

[2]The exception being Abdel Rahim et al. (2013) who find that health status of displaced households in Nuba Mountains in Sudan actually improves due to the behavioral change (hygiene, use of mosquito nets and family planing).

The aftermath of the war in Croatia is as follows: estimates of total casualties are around 22,000 individuals,[3] while the estimates for the number of refugees and internally displaced persons of all nationalities is more than half a million individuals, which represents a significant portion of Croatia's 4.7 million population in 1991. For example, in March 1993 there were 237,000 individuals internally displaced, while 163,000 went to seek refugee (Repac-Roknić, 1992). Ethnic Croats were displaced mostly during the 1991 and 1992 as Serbian forces progressed, while ethnic Serbs were displaced during 1995 as Croatian forces engaged in military operations to reclaim occupied territories.[4] After the recovery of occupied territories in 1995 and 1998, internally displaced Croats begun their return to their homes. For example, in May 1995 there were 210,592 internally displaced individuals, while in April 2003, at the time when Croatian Adult Health survey was collected, around 16,000 people in Croatia were still internally displaced (Global IDP Database, 2004).

3 Data

Our main source of data is the Croatian Adult Health Survey 2003 (henceforth CAHS), collected by the Ministry of Health of the Republic of Croatia with consultancy of the Canadian Society for International Health. Sampling was stratified by six geographical regions in Croatia (North, South, East, West, Central and the capital Zagreb) from which 10,766 households were randomly picked for an interview. In total, 9,070 individuals older than 18 were interviewed, which implies that the response rate was 84.3 %. Individuals were interviewed from March to June 2003 with the assistance of 238 visiting nurses. The survey is representative on the national as well as on the regional level. Out of 9,070 individuals 3,229 were reinterviewed in 2008.[5] CAHS contains information on measured health outcomes, The Medical Outcome Study 36-item short-form health survey (SF-36), data on the use of health infrastructure, data on eating, smoking, drinking and exercising habits as well as basic demographics, migrations and labor activities (Vuletić and Kern, 2005).

CAHS has three particularities which make it convenient for analyzing the effect of displacement in Croatia. The first one is the explicit identification of individuals that migrated during the 1991-1995 due to the war, a desirable feature in the analysis of forced displacement (Ruiz and Vargas-

[3] Živić and Pokos (2004) estimate that 22,192 individuals were killed: 8,147 Croatian soldiers, 6,605 Croatian civilians and 1,218 missing persons from Croatia as well as 6,222 Serbian casualties.

[4] Global IDP Database (2004) reports that total of 220,000 ethnic Croats were internally displaced at the beginning of the war, while 300,000 ethnic Serbs were displaced in 1995.

[5] We do not utilize a panel structure of the data as only 293 individuals were displaced in the 2008 survey, compared to the 912 displaced individuals in the 2003 survey. Also, displacement status is time invariant.

Silva, 2013). In particular, forced migrants are identified using a question: "Did you change your place of living between 1991 and 1995?"; where the five answers are: Yes, as a refugee/displaced person; Yes, for a job; Yes, to participate in a war; Yes, for some other reason; No. We exclude individuals that migrated in order to participate in the war, individuals that migrated for a job and ones that moved for other reasons, using the war displaced as a treatment and non-movers as a control group.[6]

Second, CAHS contains data on the county of residence just before the war (on March 31, 1991), which we use to construct an instrument in order to address the potential endogeneity of the displacement status. Therefore, we only include individuals who resided in Croatia in pre-war 1991, excluding individuals that lived in other parts of former Yugoslavia or some other country (278 individuals in total) in 1991. This also implies that large influx of individuals that came to Croatia fleeing from the war in Bosnia and Herzegovina are not a part of the analysis.

Third, CAHS was collected in 2003, which coincides with the return of the majority of internally displaced individuals to their homes. In particular, out of 220,000 internally displaced Croatians during the war, in April 2003 around 16,000 individuals remained displaced (Global IDP Database, 2004), which is similar to the return pattern of displaced individuals in CAHS as in 2003 87% of the displaced individuals had the same county of residence as in 1991. Therefore, CAHS captures health dimensions of displaced individuals shortly after they have returned to their homes. Note that CAHS does not include individuals that stayed displaced outside Croatia until 2003.[7]

We restrict our analysis to females. The reasons are the following. First, CAHS does not provide information on the war-veteran status. Therefore, if an individual reported not being displaced and served in the war, (s)he would be included in the control group (non-displaced). As most of the individuals who served in the war are males, we exclude males to avoid including war veterans in the control group. Second, given the male war mortality there might be non-random sampling of males into the survey.

CAHS is successful in recording post-displacement outcomes, also it provides limited, yet useful, information prior to displacement (the county of residence), but fails to provide any information during the displacement. In particular, we do not observe the duration of displacement, locus of

[6]In total 411 individuals: 86 moved for a job, 41 to participate in war, 284 for some other reasons. Such a disproportionately small number of county changing veterans (half a million of individuals has veteran status) can be explained by two reasons. The first one is the local place of war service, so individuals who served did not change residence, while the second is the fact that participating in the war was not perceived and reported as migration.

[7]This includes ethnic Croats, as well as Serbs. In fact the Serbian population in Croatia decreased from 581 thousand in 1991 to 201 thousand in 2001, (Census of Population, 1991) and (Census of Population, 2001).

displacement (whether a person was a refugee or an internally displaced person) nor the type of accommodation during the exile, all of which is relevant in explaining the severity of the displacement effect (Porter and Haslam, 2001).

To construct the instrument for the displacement status we utilize information on pre-war county of residence to construct the approximation for war intensities across counties. As an instrument we use the portion of civilian casualties in county population obtained from Živić (2001).[8] Figure 1 shows the number of civilian casualties across counties per 1,000 inhabitants, which is the instrument we use.

As we have included into our analysis only individuals who were living in Croatia in pre-war 1991 and at the time of the survey collection in 2003, thus excluding a large influx of refugees from Bosnia during the 1992-1995 war in Bosnia, as well as the Serbian minority in Croatia that migrated when Croatia reclaimed its occupied territories in 1995, we speculate that we have run our analysis mostly on ethnic Croats (ethnicity is not recorded in the data set).

Figure 1: Civilian casualties by county

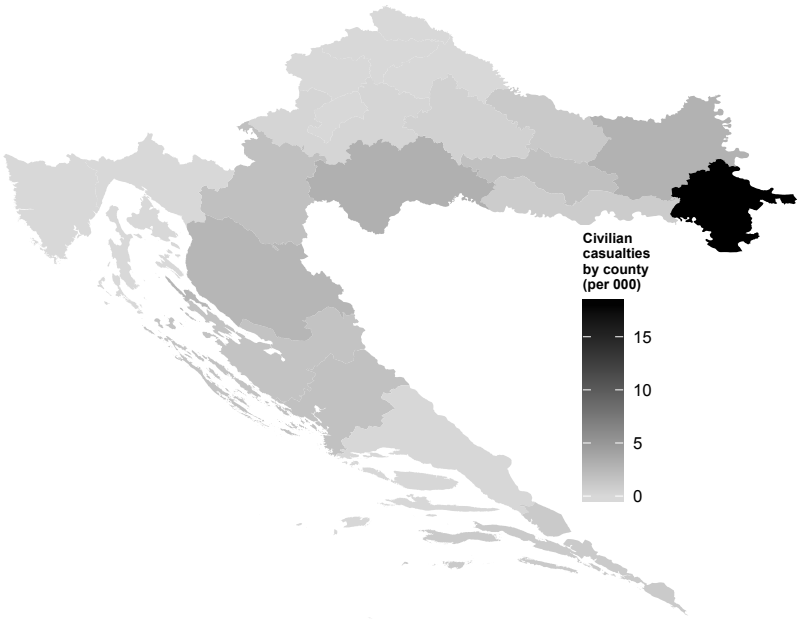


Table 1 presents the descriptive statistics of outcome variables for females across the displacement status.[9] All outcomes, except systolic hypertension, obesity and bodily pain are significantly

[8]Includes killed, exhumed, missing and civilians killed on freed territories during the presence of United Nations Protective Force and United Nations Confidence Restoration Operation in Croatia.

[9]For details on constructing the outcome variables see the Appendix.

lower for displaced females.

Table 1: Descriptive statistics of health outcomes

Displaced	Yes	No	Diff.
Healthy	0.356	0.428	-0.072***
No systolic hypertension	0.495	0.522	-0.027
No diastolic hypertension	0.644	0.730	-0.086***
No tachycardia	0.677	0.735	-0.058**
No obesity	0.758	0.733	0.025
# chronic diseases	-3.710	-3.454	-0.256*
Life satisfaction	4.985	5.514	-0.529***
Physical functioning	58.245	63.666	-5.421***
Role physical	48.801	55.929	-7.128***
Bodily pain	60.245	62.727	-2.482
General health	46.806	50.152	-3.346***
Vitality	46.806	49.863	-3.057***
Social functioning	66.489	70.805	-4.316***
Role emotional	54.461	66.449	-11.988***
Mental health	56.130	60.743	-4.613***
Observations	396	4268	-

Note that, for the ease of reading, all variables are transformed so that higher value implies better health. Diff. represents the difference in outcome between the displaced and the non-displaced individual.
Significance levels : $*$: 10% $**$: 5% $***$: 1%

4 Empirical strategy

The basic estimate can be represented as:

$$Health_i = \alpha + \beta Displaced_i + \lambda' X_i + \epsilon_i \tag{1}$$

where $Health_i$ represents different health dimensions presented in Table 1.[10] The variable $Displaced_i$ takes the value 1 if a person i was displaced due to war in 1991-1995 period, while X_i is the vector of controls.

OLS or probit estimate of (1) might produce biased estimates of the β coefficient. As Czaika and Kis-Katos (2009) and Ibáñez and Vélez (2008) show, even when facing conflict and war violence, economic conditions play an important role in displacement decisions. Self preservation is a dom-

[10]Outcomes healthy, no systolic hypertension, no diastolic hypertension, no tachycardia and no obesity are dummy variables taking the value 1 if the statement in the name of the variable is true. The # chronic diseases is in fact the minus of the number of diagnosed chronic diseases, while life satisfaction is ranging from 0 to 11. Outcomes physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional and mental health are constructed using SF-36 part of the Croatian Health Survey, ranging from 0 to 100. For a detailed explanation on the outcome variable construction see the Appendix.

inant motive, but other motives are not completely suspended. Following Ruiz and Vargas-Silva (2013), an individual i will choose displacement if her utility when going into displacement (D) is higher than the utility of staying (S), i.e. if $U_{iD} > U_{iS}$. Note that $U_{iD} = f(R_{iD}, Y_{iD}, C_{iD}, O_{iD}, V_{iD})$, where R_{iD} is the exposure to war violence, Y_{iD} are economic opportunities, C_{iD} are costs of moving, O_{iD} are other relevant factors and V_{iD} are unobserved characteristics. Therefore, an individual might self-select into displacement based on latent health and other health related variables thus making the displacement an endogenous covariate and estimates biased.

Endogeneity concerns are amplified by observed war migration. First, there is no whole population flight from war-inflicted ares. For example, even in the most war-affected regions, the east part of Croatia (see Figure 1), we do not observe the displacement of the whole population. In particular, in March 1993, 25.6% of Vukovar-Syrmia county population was displaced. The reasons might be within county disparities of war intensity (not all of the county was occupied) or county ethnic mix (mainly ethnic Croats were displaced), but selection into displacement cannot be *a priori* discarded. Second, in CAHS there are individuals who reported being displaced even if they resided in the north-west part of Croatia, which was not exposed to war. Hence, we observe migration that was war-related but not forced, i.e. there are individuals which were not directly exposed to violence, but mere proximity to conflict and uncertainty triggered the displacement decision.

Given that we are observing only few pre-war characteristics (education and age), by testing the difference of these characteristics across displacement status, we cannot claim that there is no issue of selection into displacement. Therefore, we use an instrumental variable approach, like Kondylis (2010).

4.1 Identification

In order to account for the potential endogeneity of the displacement status, we model the displacement:

$$Displaced_i = \theta + \Pi\, Civilian_i + \phi' X_i + \nu_i \tag{2}$$

where $Civilian_i$ represents a portion of civilian casualties during the 1991-1995 war in the individual's i pre-war county of residence. X_i is the vector of controls which includes: 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence,[11] pre-war county unemploy-

[11] We use 2007-2012 versions of NUTS2 classification.

Table 2: First stage estimates

	(1)	(2)
Civilian casualties	24.320***	17.567***
	(5.246)	(4.380)
Controls	No	Yes
F on excluded instrument	21.49	16.09
Adjusted R^2	0.102	0.134
Observations	4664	4663

Note: Reported results come from the first stage of 2SLS where endogenous covariate is war displacement status and the instrument is portion of civilian casualties in the pre-war county of residence. Second specification includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. Standard errors are clustered at pre-war county of residence level (21 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

ment rate and GDP per capita. Although a richer set of covariates is available, we avoid using covariates that could be affected by the displacement status. For example, Sarvimäki et al. (2009), Kondylis (2010) and Bauer et al. (2013) show that displacement is significant in explaining income and labor market outcomes in Finland, Bosnia and Herzegovina and Germany. Therefore using income and labor market variables as controls would qualify as using bad controls (Angrist and Pischke, 2008). As education is affected by displacement (Eder, 2014), we circumvent this problem by excluding individuals that were younger than 25 at the beginning of the war in 1991.

We estimate (1) and (2) with 2SLS. In order to obtain the Local average treatment effect (LATE) we need to discuss four assumptions: relevance and the exogeneity of the instrument, exclusion restriction and monotonicity (Angrist and Pischke, 2008).

First stage results presented in Table 2 show that, although the instrument is based on 21 counties of pre-war residence, it is highly significant in explaining the displacement decision. As for the strength of the instrument, following Stock et al. (2002), we conclude that the correlation between civilian casualties per county and the displacement status for females is strong enough to exclude weak instrument issues.[12]

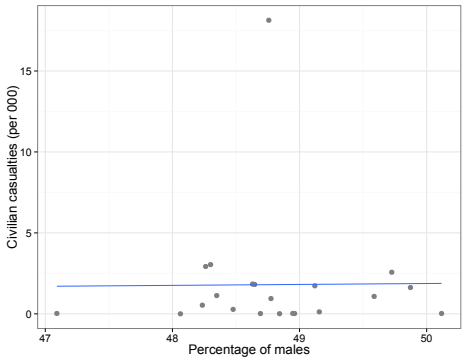
To argue the exogeneity of the instrument we need to support the claim that civilian casualties i.e., war intensity, are randomly assigned across counties. Although we cannot directly test whether patterns of the conflict in Croatia are driven by pre-war health status in counties, this seems rather implausible. Still, there might be other variables, that are health related, that are not random with

[12]Comaparing the Kleibergen-Paap Wald F statistic of 21.49 and 16.09, for the case without and with covariates, with critical values from Stock and Yogo (2005) yields the same conclusion.

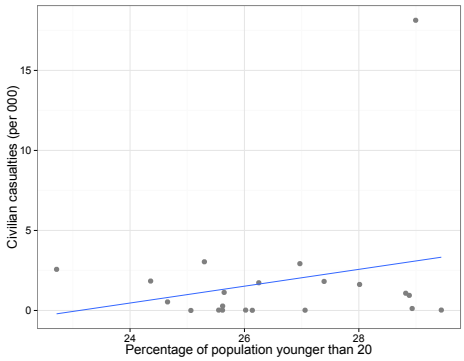
respect to the instrument. The first one is overall economic situation. We avoid this potential threat by including pre-war county GDP per capita, county unemployment rate as well as NUTS2 dummies as covariates in the 2SLS. The second such variable is county demographic structure. Figure 2, on which we compare pre-war population characteristics and war intensity across counties, indicates no systematic relationship between chosen demographic characteristics and civilian casualties per county.

Figure 2: War intensities and population characteristics across counties

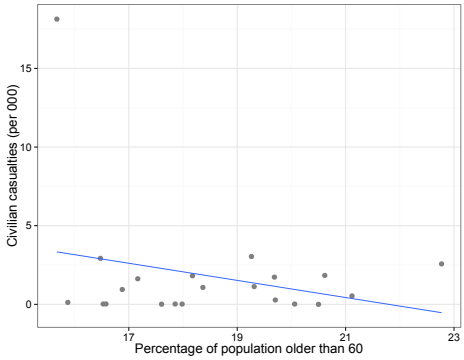
(a) Percentage of males



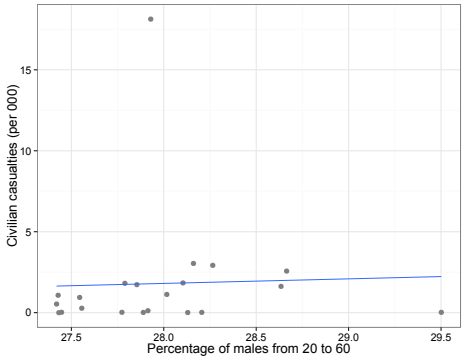
(b) Percentage of population younger than 20



(c) Percentage of population older than 60



(d) Percentage of males from 20 to 60



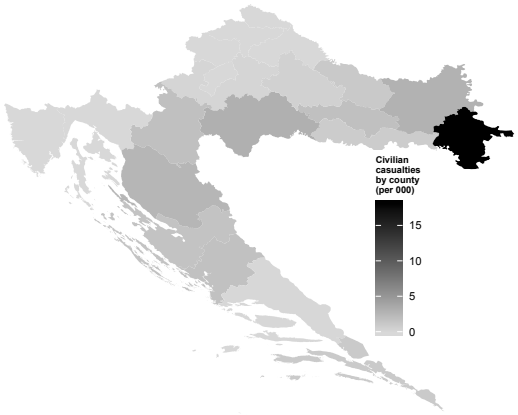
In order to reinforce the claim that civilian casualties are orthogonal to pre-war health or health related variables, note that the war in Croatia started, and was the most intense, in areas where ethnic structure was mixed (Figure 3 supports this claim). In particular, war was fought most intensely in the area of the Republic of Srpska Krajina, which was proclaimed by rebel Serbian forces. Therefore as the local variation of war intensity is determined by ethnic structure, our instrument is as good as random with respect to pre-war health status and health related variables.

We devote our whole sensitivity analysis to address possible violations of the exclusion restriction. In fact, it seems plausible that the instrument, civilian casualties across counties, affects

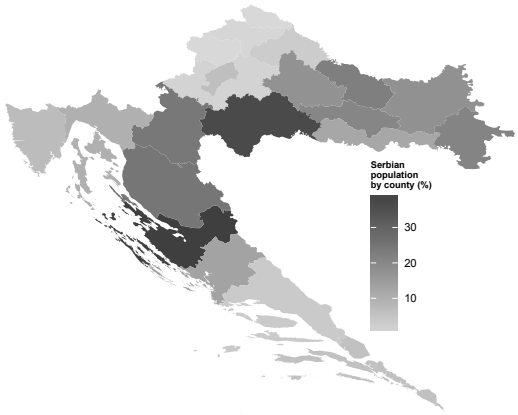
health directly, and not only through displacement, thus producing biased estimates. In the sensitivity analysis section we present the results addressing this issues, using the methods from Conley et al. (2012).

Figure 3: War intensity and ethnic mix

(a) Civilian casualties per county



(b) Serbian popluation in 1991 before the war



Monotonicity is satisfied if all individuals that changed displacement decision due to the war, changed it in the same direction, i.e., if there are no defiers (Angrist and Pischke, 2008). Intuitively, this implies we should not have individuals that decided to stay in the county of residence due to the war. Although self-preservation reasoning suggests that individuals would run away from war, monotonicity could be violated. In particular, there might be ethnic Serbs in Croatia that decided to stay in their county of residence just because Republic of Srpska Krajina was proclaimed, which induces a bias in the IV estimates Klein (2010). However, as in 1995, when occupied Croatian territory was reclaimed, a number of ethnic Serbs was displaced from Croatia, and we are including only individuals that resided in Croatia in 1991 as well as in 2003, it seems unlikely that defiers are included in the analysis.

In order to accommodate for the binary nature of some outcome variables[13] we also run bivariate probit (BP) when applicable. Bivariate probit version of (1) and (2) can be represented as $Displaced_i = \mathbf{1}\{\theta + \Pi Civilian_i + \phi' X_i > \nu_i\}$ and $Health_i = \mathbf{1}\{\alpha + \beta Displaced_i + \lambda' X_i > \epsilon_i\}$, where ν_i and ϵ_i have a joint normal distribution. As pointed out by Chiburis et al. (2012) bivariate probit outperforms IV estimations when sample size is small ($< 5,000$) and when treatment probability is close to 0 or 1, which is the case in our application.

[13]Healthy, No systolic hypertension, No diastolic hypertension, No tachycardia, No obesity.

5 Results

As pointed out by Sarvimäki et al. (2009) and Bauer et al. (2013), we cannot claim that the estimated effects are mean differences between health outcomes of displaced individuals and the outcomes in a counterfactual situation where displacement did not occur. Instead, due to the general equilibrium effects of displacement, we define the counterfactual states as (i) being displaced in war-inflicted Croatia and (ii) not being displaced in war-inflicted Croatia.

Results presented in Table 3 indicate a significant adverse effect of displacement across different model specifications and estimators. For example, probability that an individual would assesses her health as good, very good or excellent decreases if she was displaced. This conclusion can be derived from probit, bivariate probit and IV estimates, with or without covariates. This adverse effect is highly significant in all specifications. Comparing the magnitude of effect on healthy dummy for probit and bivariate probit and IV estimates yields a conclusion that once we account for selection into displacement (IV and bivariate probit) the adverse effect tends to increase. Similar conclusions can be read from the results for systolic and diastolic hypertension. Effect of displacement is adverse, significant and increasing once we control for selection into displacement. Probability of suffering from tachycardia is also increasing with displacement, but this conclusion is not robust as the results are not significant across specifications. Obesity and number of chronic diseases are not significantly explained by displacement status.[14] Life satisfaction also seems to be negatively affected by displacement, although comparing OLS and IV estimates reverses the selection into displacement pattern found in the healthy dummy and blood pressure outcomes.

Results for SF-36 outcomes, presented in Table 4, reveal a similar pattern. All outcomes, except for the bodily pain, are negatively affected by displacement, highly significant and amplified once we account for the selection into displacement.

In order to reinforce these findings we also provide results using additional estimates. First concern is the number of clusters and inference. Given that we are clustering on pre-war county of residence, we only have 21 clusters which might lead to downward biased standard errors and incorrect inference (Cameron and Miller, 2015). To circumvent this issue we provide results using standard errors at the post-war settlement level. Not only are we increasing the number of clusters to 443, but also allowing for error correlation between the individuals that choose same settlement in 2003. Tables 8 and 9 in Appendix provide results. Standard errors are higher for most of the

[14] We also run separate estimates for each of the 19 chronic diseases, but no significant results are found. For some of the chronic diseases, the incidence is very low (less than 5%).

outcomes and specifications, making the effect of displacement on tachycardia and life satisfaction insignificant. Still, even with higher standard errors, displacement has a significant adverse effect on healthy dummy, systolic and diastolic hypertension. As for the SF-36 outcomes, after clustering at the post-war settlement level, negative effect of displacement stays significant for role physical, general health, role emotional and mental health.

In the second robustness check we exclude the most war-affected county (Vukovar-Syrmia county). As can be seen from figures 1 and 2, Vukovar-Syrmia County (east on Figure 1) is a clear outlier in terms of civilian casualties. After excluding this county, we are left with 4,464 observations (316 displaced and 4,148 controls). We perform inference by clustering at the pre-war county of residence as well as post-war settlement. Results are presented in Appendix in Tables 11, 12, 13 and 14 and indicate that displacement has an adverse and significant effect on systolic and diastolic blood pressures as well as on social functioning and role emotional. Significance of these estimates holds with both levels of clustering.

In the third robustness check we only include counties that were more severely hit by the war. In particular, we exclude counties that had lees than 0.05% civilian casualties, so we include 12 counties with, in total, 1,820 observations (362 displaced and 1,458 controls). We perform inference by clustering at the pre-war county of residence as well as post-war settlement. Results, presented in Appendix in Tables 15, 16, 17 and 18, reinforce the results of the baseline specification.

Therefore, baseline results that indicate significant and adverse effect of displacement on health dimensions, hold for different estimation procedures, specifications, levels of clustering and different subsamples. In particular, outcomes that are affected in most of the results presented are healthy dummy, systolic and blood pressures, role emotional and mental health. In addition, for most of the mentioned outcomes we find that bivariate probit and IV procedures give quantitatively higher effects than probit and OLS.[15]

Results for IV estimates rely on the assumption of the non-violation of the exclusion restriction, i.e., civilian casualties per county should explain health outcomes exclusively through displacement. Addressing for potential violation of exclusion restriction is presented in the following section.

[15] All of the empirical analysis that has been done for females, has also been done for the male subpopulation, and we have found no robust adverse effect of displacement on health. The most likely reason for this, as was mentioned in the Data section, is the inclusion of war veterans in the control group.

Table 3: War displacement effects

Outcome	Simple estimates		Bivariate probit		IV estimates	
	(1)	(2)	(1)	(2)	(1)	(2)
Healthy	-0.073***	-0.058***	-0.316***	-0.291***	-0.356***	-0.498***
	(0.028)	(0.021)	(0.064)	(0.107)	(0.100)	(0.173)
No systolic hypertension	-0.027	0.016	-0.268***	-0.271**	-0.403***	-0.538***
	(0.045)	(0.041)	(0.028)	(0.132)	(0.052)	(0.070)
No diastolic hypertension	-0.081*	-0.051	-0.165***	-0.235	-0.321***	-0.478***
	(0.045)	(0.043)	(0.042)	(0.143)	(0.068)	(0.098)
No tachycardia	-0.055	-0.035	-0.225***	-0.228	-0.245***	-0.302*
	(0.053)	(0.053)	(0.050)	(0.179)	(0.042)	(0.180)
No obesity	0.025	0.048**	-0.051	-0.005	-0.088	0.032
	(0.025)	(0.023)	(0.042)	(0.083)	(0.062)	(0.109)
# chronic diseases	-0.255	-0.211	-	-	-0.548*	0.357
	(0.198)	(0.225)	-	-	(0.286)	(0.721)
Life satisfaction	-0.529***	-0.330**	-	-	-0.290***	-0.193**
	(0.145)	(0.145)	-	-	(0.050)	(0.093)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. Simple estimates refer to probit estimation for healthy, no systolic hypertension, no diastolic hypertension, no tachycardia and no obesity; and OLS estimates for the # of chronic diseases and life satisfaction. Coefficients presented in probit and bivariate probit estimation are marginal effects. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the pre-war county of residence level (21 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 4: War displacement effects - SF-36 indicators

	OLS estimates		IV estimates	
	(1)	(2)	(1)	(2)
Physical functioning	-5.421**	-3.989*	-13.566***	-7.219**
	(2.509)	(1.988)	(4.386)	(3.368)
Role physical	-7.128**	-4.221	-33.441***	-37.978***
	(3.360)	(3.152)	(6.584)	(9.459)
Bodily pain	-2.482	-1.627	-8.638*	-7.374
	(2.394)	(2.307)	(4.731)	(8.039)
General health	-3.346*	-2.713	-12.629***	-16.575***
	(1.919)	(1.690)	(3.917)	(5.041)
Vitality	-3.057*	-2.206	-11.557***	-13.075***
	(1.560)	(1.511)	(3.356)	(4.737)
Social functioning	-4.316**	-3.481*	-12.278***	-15.123***
	(2.050)	(1.874)	(2.972)	(5.724)
Role emotional	-11.987***	-10.891***	-24.975***	-27.300***
	(3.060)	(3.091)	(4.469)	(5.892)
Mental health	-4.613***	-17.068***	-3.387**	-18.241***
	(1.408)	(2.933)	(1.463)	(3.898)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the pre-war county of residence level (21 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

5.1 Sensitivity analysis

In this section, we relax the exclusion restriction assumption needed for IV. We concentrate on those health dimensions for which the displacement status has a significant adverse effect. The instrument, portion of civilian casualties per county, is reflecting war intensity across counties and there is substantial evidence that exposure to war violence directly affects long run health dimensions, for example Kesternich et al. (2014) and Akbulut-Yuksel (2014). During the war in Croatia more than 37,000 people were injured (Perković and Puljiz, 2001), which produces a long-term impact on health. Therefore it might be restrictive to claim that the instrument affects the health exclusively through displacement, especially given that the data set does not record disabilities. In order to address this potential violation of the exclusion restriction we use two methods from Conley et al. (2012). Suppose we have one endogenous covariate X, and one instrument Z:[16]

$$\begin{aligned} Y &= \beta X + \gamma Z + \epsilon \\ X &= \Pi Z + v \end{aligned} \tag{3}$$

If $\gamma = 0$, the exclusion restriction holds, but if $\gamma \neq 0$, then $\hat{\beta}_{IV} \xrightarrow{p} \beta + \gamma/\Pi$. As the instrument might affect the health dimension in the same direction as the displacement, IV estimates are giving estimates biased towards a more adverse effect of displacement. To account for the possibility of $\gamma \neq 0$ (in particular, for $\gamma < 0$) we apply union of confidence interval and local to zero approximation methods from Conley et al. (2012).

In the union of confidence intervals we need to specify the support of γ, $\mathcal{G}$. If the true γ is $\gamma_0 \in \mathcal{G}$, we can run IV estimation on $(Y - \gamma_0 Z) = \beta X + \epsilon$. After obtaining $\hat{\beta}(\gamma_0)$ we construct $(1-\alpha)$ confidence interval for this particular estimate. Repeating this procedure for different $\gamma \in \mathcal{G}$ and taking the union of confidence intervals gives us $(1-\alpha)$ confidence interval for the parameter of interest under the violation of the exclusion restriction:

$$CI_N(1-\alpha) = \bigcup_{\gamma_0 \in \mathcal{G}} CI_N(1-\alpha, \gamma_0) \tag{4}$$

In order to provide an automatic way of defining the support of γ and giving the intuition of the degree of violation of the exclusion restriction, we use a 95% interval of effect of the instrument on

[16] It is straightforward to accommodate the model for covariates, see the Appendix of the 2007 working paper version of Conley et al. (2012).

the corresponding health dimension for the non-displaced females. In particular, for non-displaced females, we run an OLS regression where covariates used in previous specifications as well as the instrument are explaining health dimension and include the 95% of the effect of the instrument on health dimension in the graphical results (dashed gray line in the left panel of Figures 4 and 5).[17]

In the second method, local to zero approximation, uncertainty regarding γ is considered to be of the same magnitude as the sampling uncertainty. Conley et al. (2012) show that violation of exclusion restriction can be modeled as:

$$\begin{aligned} \hat{\beta} &\overset{approx}{\sim} N(\beta, V_{2SLS}) + A\gamma \\ A &= (X'Z(Z'Z)^{-1}Z'X)^{-1}(X'Z) \\ \gamma &\sim F \end{aligned} \tag{5}$$

Where $N(\beta, V_{2SLS})$ represents 2SLS asymptotic distribution, while the second term represents the influence of violation of the exclusion restriction, which is modeled by specifying a prior distribution of γ, F. Imposing that $\gamma \sim N(\mu_\gamma, \Omega_\gamma)$, then the $\hat{\beta} \overset{approx}{\sim} N(\beta + A\mu_\gamma, V_{2SLS} + A\Omega_\gamma A')$. We present the results imposing $\gamma \sim N(0, \delta)$ and defining the support for δ. Note that using a normal distribution centered around 0 we allow for the effect of the instrument on the health outcome to be positive, but as we are concerned with the significance of the effect we are concentrating only on the upper bound of the effect.

On the left panel of the following figures confidence union results are presented (support for γ can be inferred from the x axis, gray dashed line is the 95% confidence interval of the effect of the instrument on the outcome for non-displaced females), while the right panel represents the results using local to zero approximation (support of δ can be inferred from the x axis).

To facilitate the interpretation of the graphs we suggest the following. First, at the x axis of the left panel of figures we can observe how strong does the violation of exclusion restriction need to be in order for displacement to turn insignificant (upper bound of 95% confidence intervals hits zero). For example, in the case of variable healthy, the effect of displacement turns out to be insignificant when the effect of the instrument on healthy dummy is -3.62. As the instrument values are ranging from 0 to 0.0181326 (portion of civilians killed in county population), we can

[17] For health dimensions where the instrument is not significant for non-displaced females, we also use this procedure. Note that in this case the support of γ will include zero, and as we are concerned only with the upper bound of the effect when $\gamma \leq 0$, while constructing graphs we divide the support of γ to $\gamma \leq 0$ and $\gamma > 0$ and merge graphs at $\gamma = 0$. We do so because in the case when the $\gamma > 0$, violation of exclusion restriction is actually strengthening the effect of displacement.

interpret this magnitude of violation restriction. In particular, displacement is not significant if, the direct effect of increasing civilian casualties from 0 to 0.0181326, reduced the probability that an individual will report her health as good for more than 6.56%.

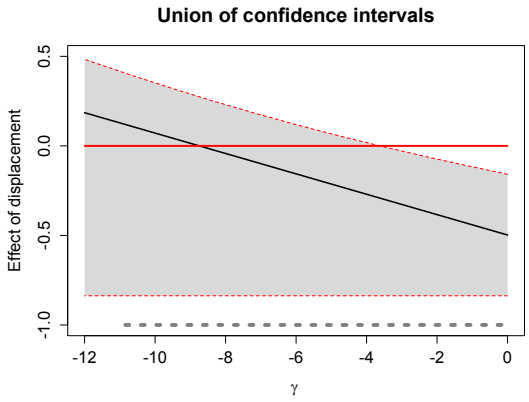
Second, on the left panel of the graphs, the dashed line at the bottom represents a 95% confidence interval on the effect of the instrument on the health outcome for non-displaced females. This is done in order to provide intuition on the magnitude of the violation of the exclusion restriction. For example, in the case of a healthy dummy we see that for approximately one third of this interval, the effect of displacement still remains significant. Note also that this rule of thumb is very conservative, as the OLS estimation of effect of an instrument directly on health outcome of non-displaced females is imprecise due to the sample size.

Third, on the right panel of the graphs, results from the Local to zero approximation method are presented. The degree of violation restriction depends on the variance of the distribution. For example, in healthy dummy variable the effect of displacement stops being significant at the point where exclusion restriction is $N(0, 11)$ and the 95% interval for this distribution is $\pm$ 6.5, and therefore even with this uncertainty regarding the violation of the exclusion restriction, the displacement is still significant.

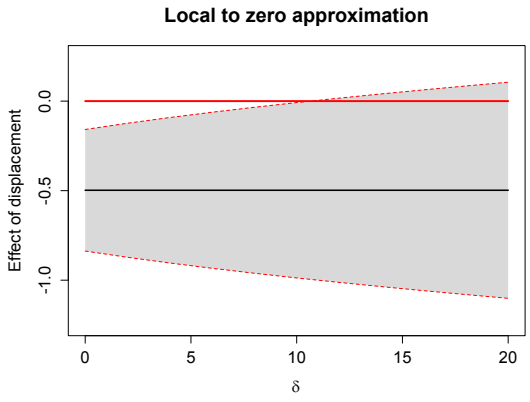
Figures show that most of the outcomes are robust to moderate violation of the exclusion restriction. This is particularly true for the role physical, role emotional and mental health as for these outcomes the direct effect of civilian casualties needs to be the strongest in order for displacement to turn insignificant. Using the second proposed method to evaluate the magnitude of the violation of the exclusion restriction, we conclude that systolic hypertension and role emotional are most robust to the violation of the exclusion restriction as for them the displacement is significant for the most part of the support of the violation of the exclusion restriction (defined using the 95% interval of the effect of instrument on health outcome). This is also consistent with local to zero approximation method conclusions. Therefore, for the variables mentioned, even with substantial departure from the exclusion restriction, displacement still has a significant adverse effect on health dimensions.

Figure 4: Violation of exclusion restriction

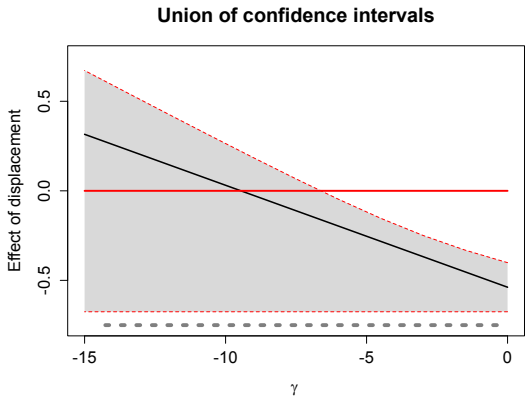
(a) Healthy



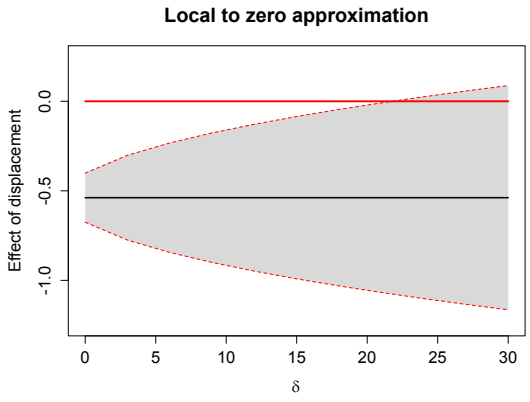
(b) Healthy



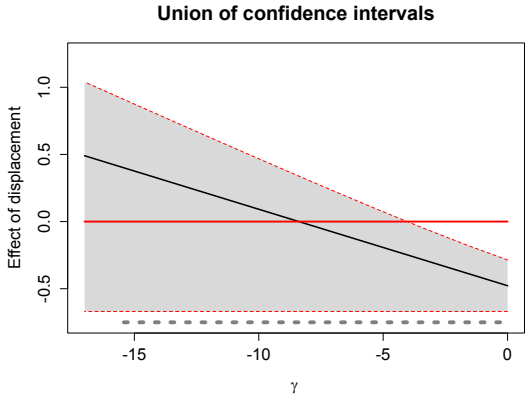
(c) No systolic hypertension



(d) No systolic hypertension



(e) No diastolic hypertension



(f) No diastolic hypertension

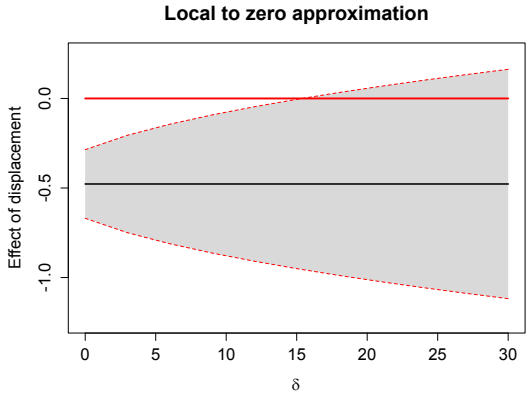
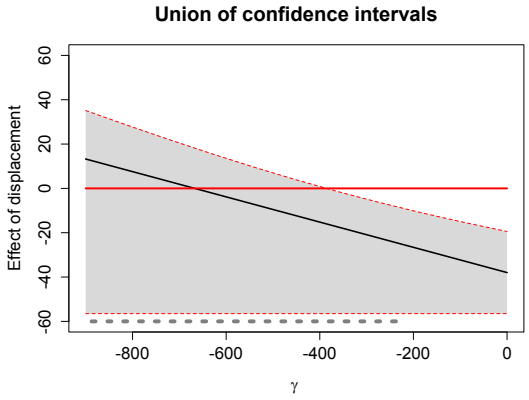


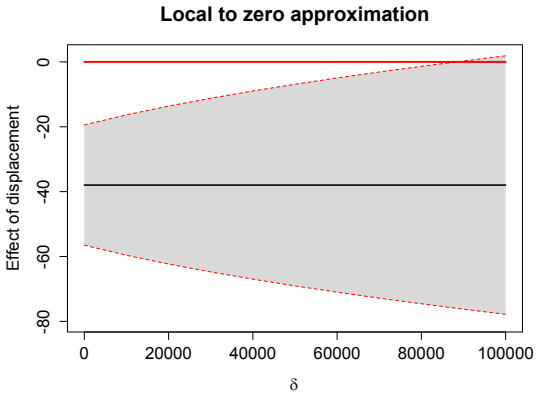
Figure presents the effects of displacement allowing for the violation of the exclusion restriction. Left panels represent results using the Union of confidence interval, where γ represents the violation of the exclusion restriction in (3). Grey dashed line presents 95% confidence interval of the effect on instrument on health outcome for non-displaced females. Right panels represent the results using Local to zero approximation, where δ presents standard deviation of the distribution of the violation of the exclusion restriction in (5). On both panels the black line presents the point estimate, while the gray surface presents 95% confidence interval of the displacement effect under different degrees of violation of the exclusion restriction.

Figure 5: Violation of exclusion restriction - SF-36 indicators

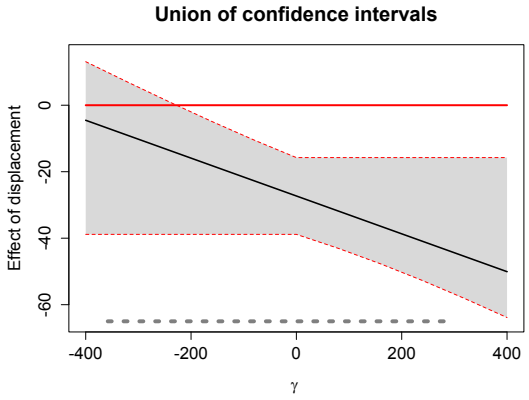
(a) Role physical



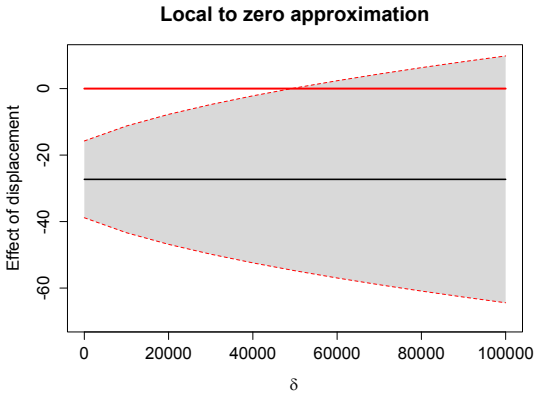
(b) Role physical



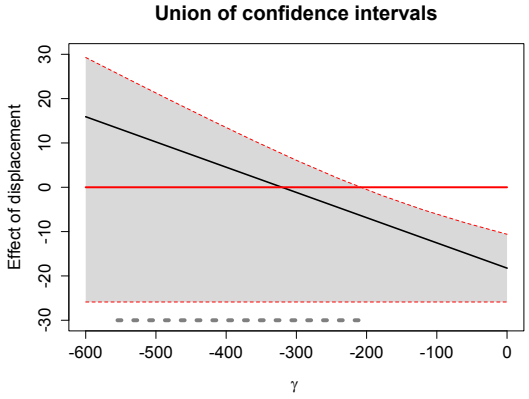
(c) Role emotional



(d) Role emotional



(e) Mental health



(f) Mental health

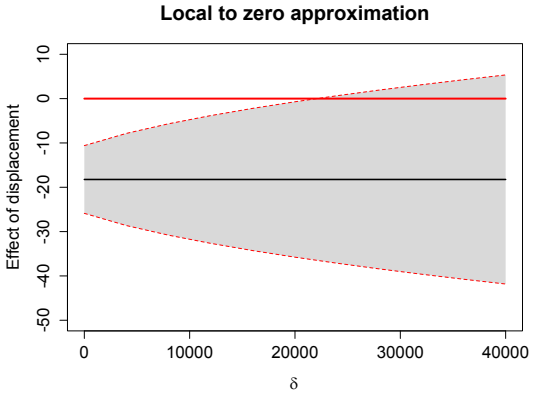


Figure presents the effects of displacement allowing for the violation of the exclusion restriction. Left panels represent results using the Union of confidence interval, where γ represents the violation of the exclusion restriction in (3). Grey dashed line presents 95% confidence interval of the effect on instrument on health outcome for non-displaced females. Right panels represent the results using Local to zero approximation, where δ presents standard deviation of the distribution of the violation of the exclusion restriction in (5). On both panels the black line presents the point estimate, while the gray surface presents 95% confidence interval of the displacement effect under different degrees of violation of the exclusion restriction.

5.2 Possible channels of adverse effects

We briefly address possible channels of adverse effects of displacement for females. We run the same bivariate probit and IV estimation and simple estimates for other outcomes that might be health related. In particular, we analyze the effect of displacement on healthy behaviors of individuals (eating, drinking, smoking and physical activity), marriage status, probability of losing a husband and economic outcomes such as labor activity and household income.[18] Results indicate that there is no robust and significant evidence of change in healthy behaviors for displaced females, if any, there is even positive effect on drinking behavior, contradicting the findings that traumatic experiences induce risky behavior.

Coefficient next to labor activity changes sign across specifications, marriage status also seems not to be affected, while probability of being widowed actually reduces. The only significant and robust effect of displacement is on household income. This result indicates that returnees usually face economic burden related to ruined houses and homes. Indeed, Global IDP Database (2004) reports that returnees, although supported by national authorities, face violations of social rights, including access to pensions, disability, health insurance, and labor entitlements. This result is in line with findings from Fiala (2012) and Abdel Rahim et al. (2013) who find that displaced individuals are, due to dispossession, facing adverse economic conditions.

For additional robustness, we provide estimates using standard errors clustered at the post-war settlement level. Results presented in Table 10 in the Appendix show that, with higher standard errors, only the household income stays significantly affected by displacement.

[18] For the details on constructing the variables see the Appendix.

Table 5: Potential channels of adverse effects

Outcome	Probit estimates		Bivariate probit		IV estimates	
	(1)	(2)	(1)	(2)	(1)	(2)
No eating issues	0.006	0.001	-0.101**	0.002	-0.163**	-0.156**
	(0.029)	(0.040)	(0.046)	(0.100)	(0.081)	(0.070)
No drinking issues	0.019*	0.012	0.177*	0.118	0.051***	0.033***
	(0.011)	(0.011)	(0.108)	(0.091)	(0.008)	(0.009)
No smoking issues	-0.005	-0.016	-0.046	-0.071	-0.007	-0.099**
	(0.027)	(0.019)	(0.056)	(0.057)	(0.075)	(0.050)
Physically active	0.035*	0.017	0.056	0.112	0.078	0.097
	(0.021)	(0.022)	(0.059)	(0.093)	(0.073)	(0.086)
Labor active	-0.008	0.011	-0.141***	0.040	-0.151***	0.104*
	(0.033)	(0.032)	(0.037)	(0.052)	(0.042)	(0.056)
Not widowed	-0.035	-0.009	-0.027	0.001	-0.047	0.135***
	(0.027)	(0.019)	(0.037)	(0.048)	(0.053)	(0.048)
Married	0.005	-0.005	0.061*	0.188	0.054**	0.031
	(0.011)	(0.011)	(0.033)	(0.133)	(0.027)	(0.042)
Household income	-0.053	-0.009	-0.337***	-0.204**	-0.425***	-0.331***
	(0.036)	(0.034)	(0.045)	(0.101)	(0.060)	(0.102)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. Coefficients presented in probit and bivariate probit estimation are marginal effects. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the pre-war county of residence level (21 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

6 Conclusion

This paper provides an analysis of health consequences of war-related forced displacement that occurred in Croatia during 1991-1995 which accompanied the demise of Yugoslavia. During the course of the war in Croatia more than half a million of individuals of all ethnicities were displaced, more than 10% of Croatia's pre-war population To find the health consequences of displacement, we have used Croatian Adult Health Survey (CAHS) collected in 2003, when most of the internally displaced individuals returned to their homes. We take a stand that displacement, although to an extent a forced action, is a form of migration, and thus endogenous. In order to avoid the bias in estimates due to the self-selection into displacement issues, we have adopted an instrumental variable estimation. In particular, using a retrospective question on pre-war county of residence, we have taken civilian casualties per county as an instrument for displacement. Results for displaced females indicate that various health dimensions are adversely affected by displacement.

In particular, we have found a significant adverse effect on female's self-assessed health, systolic and blood pressures, and role emotional and mental health SF-36 dimensions. In addition, for most of the mentioned outcomes we have found that IV and bivariate probit estimates are quantitatively higher than OLS and probit. These baseline results are supported by numerous robustness checks.

In order to address a likely violation of the exclusion restriction, we have also applied two methods from Conley et al. (2012), that enable us to perform inference on the effect of displacement even if the instrument is directly affecting health outcomes. Results from the union of confidence interval and local to zero approximation indicate that even with severe departures from the exclusion restriction we still find significant adverse effects of displacement.

We have also explored possible channels of adverse effects for females. We have tested whether displacement induced a change in healthy behaviors by analyzing the effect on eating, drinking and smoking habits, as well as on physical activity. Also, we have investigated the effect on labor activity, household income and marriage status. We have not found robust and significant effects on healthy behaviors, marriage status or labor activity. However, we have found that displacement leads to higher probability of reporting that one's household's income is below average. This result supports the view that the policy aiming to mitigate displacement hardship in a moderately developed country should be focused on improving economic conditions of displaced individuals.

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Appendix

Table 6: Summary statistics

Displaced	Yes (N=396)		No (N=4268)	
Outcome	Mean	Std.dev.	Mean	Std.dev.
Healthy	0.356	0.479	0.428	0.495
No systolic hypertension	0.495	0.501	0.522	0.500
No diastolic hypertension	0.644	0.479	0.730	0.444
No tachycardia	0.677	0.468	0.735	0.442
No obesity	0.758	0.429	0.733	0.442
# chronic diseases	-3.710	2.712	-3.454	2.507
Life satisfaction	4.985	2.574	5.514	2.614
Physical functioning	58.245	32.484	63.666	29.801
Role physical	48.801	46.390	55.929	45.093
Bodily pain	60.245	30.420	62.727	29.808
General health	46.806	20.990	50.152	21.254
Vitality	46.806	22.464	49.863	22.114
Social functioning	66.489	29.618	70.805	27.899
Role emotional	54.461	47.078	66.449	44.074
Mental health	56.130	20.193	60.743	20.683
No eating issues	0.583	0.494	0.577	0.494
No drinking issues	0.995	0.071	0.982	0.131
No smoking issues	0.859	0.349	0.864	0.343
Physically active	0.803	0.398	0.769	0.421
Labor active	0.232	0.423	0.241	0.428
Not widowed	0.619	0.486	0.655	0.476
Married	0.962	0.191	0.958	0.202
Household income	0.487	0.500	0.541	0.498

Note that, for the ease of reading, all variables are transformed so that a higher value implies better outcome.

Table 7: Descriptive statistics of covariates

Displaced	Yes (N=396)		No (N=4268)	
Outcome	Mean	Std.dev.	Mean	Std.dev.
Age 25-28 (ref.)	0.081	0.273	0.074	0.261
Age 29-32	0.078	0.269	0.079	0.270
Age 33-36	0.109	0.312	0.088	0.283
Age 37-40	0.081	0.273	0.084	0.277
Age 41-44	0.096	0.295	0.096	0.295
Age 45-48	0.071	0.257	0.082	0.274
Age 49-52	0.061	0.239	0.091	0.288
Age 53-56	0.093	0.291	0.103	0.304
Age 57-60	0.078	0.269	0.101	0.301
Age 61-64	0.104	0.305	0.085	0.279
Age 65-68	0.076	0.265	0.064	0.245
Age 69-72	0.053	0.224	0.040	0.196
Age 73-76	0.013	0.112	0.006	0.079
Age 77-80	0.008	0.087	0.006	0.075
Age 81+	0	0	0.002	0.046
No education (ref.)	0.338	0.474	0.258	0.438
Elementary school	0.275	0.447	0.286	0.452
High school	0.308	0.462	0.339	0.473
College	0.053	0.224	0.055	0.228
University	0.025	0.157	0.062	0.241
Northwestern (ref.)	0.068	0.252	0.426	0.495
Central and Eastern	0.747	0.435	0.250	0.433
Adriatic	0.184	0.388	0.324	0.468

Note that regions represent pre-war regions of residence.

Construction of outcome variables

Healthy - dummy variable taking value 1 if the individual reported her health excellent, very good or good, and 0 if reported health was fair of poor.

No systolic hypertension - dummy variable taking value 1 if the individual had the average of two measures of systolic blood pressure less than 140 mm Hg.

No diastolic hypertension - dummy variable taking value 1 if the individual had the average of two measures of diastolic blood pressure less than 90 mm Hg.

No tachycardia - dummy variable taking value 1 if the individual had the average of two measures of heart rate less than 100 bpm.

No obesity - dummy variable taking value 1 if the individual had Body Mass Index (BMI) less than 30.

 # chronic diseases - minus of the number of diagnosed chronic diseases. Ranging from -19 to 0.

Life satisfaction - variable ranging from 0 to 10, where higher scores represent higher life satisfaction.

Physical functioning - derived from SF-36 part of CAHS. Measures the extent to which health limits physical functioning. Ranges from 0-100, where higher scores represent better health.

Role physical - derived from SF-36 part of CAHS. Measures the extent to which physical health limits work or usual activities. Ranges from 0-100, where higher scores represent better health.

General health - derived from SF-36 part of CAHS. Measures health status in overall. Ranges from 0-100, where higher scores represent better health.

Bodily pain - derived from SF-36 part of CAHS. Measures the extent to which pain interferes with normal work. Ranges from 0-100, where higher scores represent better health.

Vitality - derived from SF-36 part of CAHS. Measures subjective well-being in terms of energy and fatigue. Ranges from 0-100, where higher scores represent better health.

Social functioning - derived from SF-36 part of CAHS. Measures the extent to which health limits social functioning. Ranges from 0-100, where higher scores represent better health.

Role emotional - derived from SF-36 part of CAHS. Measures the extent to which emo-

tional problems interfere with accomplishment at work ot ar other usual activities. Ranges from 0-100, where higher scores represent better health.

Mental health - derived from SF-36 part of CAHS. Measures main mental health dimensions. Ranges from 0-100, where higher scores represent better health.

Construction of health related variables

No eating issues - dummy variable taking value 1 if in the last year the individual has not been advised, by a medical doctor, other medical personnel, family member, or someone else, to change eating habits.

No drinking issues - dummy variable taking value 1 if in the last year the individual has not been advised, by a medical doctor, other medical personnel, family member, or someone else, to reduce alcohol consumption.

No smoking issues - dummy variable taking value 1 if in the last year the individual has not been advised, by a medical doctor, other medical personnel, family member, or someone else, to stop smoking.

Physically active - dummy variable taking value 1 if in the last year the individual has not been advised, by a medical doctor, other medical personnel, family member, or someone else, to increase physical activity.

Not widowed - dummy variable taking value 1 if the individual is not widowed.

Married - dummy variable taking value 1 if the individual is/was married.

Household income - dummy variable taking value 1 if the individual reported that her household income is average, somewhat better than the average or much better than the average.

Estimates using standard errors clustered at the 2003 settlement level

Table 8: War displacement effect (settlement clustering)

Outcome	Simple estimates		Bivariate probit		IV estimates	
	(1)	(2)	(1)	(2)	(1)	(2)
Healthy	-0.073**	-0.058**	-0.316***	-0.291***	-0.356***	-0.498*
	(0.028)	(0.027)	(0.090)	(0.092)	(0.129)	(0.260)
No systolic hypertension	-0.027	0.016	-0.268***	-0.271***	-0.403***	-0.538**
	(0.029)	(0.027)	(0.048)	(0.081)	(0.093)	(0.228)
No diastolic hypertension	-0.081***	-0.051**	-0.165**	-0.235**	-0.321**	-0.478*
	(0.027)	(0.026)	(0.078)	(0.112)	(0.144)	(0.286)
No tachycardia	-0.055**	-0.035	-0.225**	-0.228*	-0.245**	-0.302
	(0.028)	(0.029)	(0.087)	(0.128)	(0.102)	(0.186)
No obesity	0.025	0.048**	-0.051	-0.005	-0.088	0.032
	(0.023)	(0.022)	(0.058)	(0.086)	(0.080)	(0.128)
# chronic diseases	-0.255	-0.211	-	-	-0.548	0.357
	(0.198)	(0.171)	-	-	(0.428)	(0.735)
Life satisfaction	-0.529***	-0.330**	-	-	-0.290**	-0.193
	(0.155)	(0.154)	-	-	(0.113)	(0.175)

Note: Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. Simple estimates refer to probit estimation for healthy, no systolic hypertension, no diastolic hypertension, no tachycardia and no obesity; and OLS estimates for the # of chronic diseases and life satisfaction. Coefficients presented in probit and bivariate probit estimation are marginal effects. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the settlement of residence (443 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 9: War displacement effects - SF-36 indicators (settlement clustering)

	OLS estimates		IV estimates	
	(1)	(2)	(1)	(2)
Physical functioning	-5.421***	-3.989**	-13.566*	-7.219
	(1.962)	(1.613)	(7.928)	(10.383)
Role physical	-7.128**	-4.221	-33.441***	-37.978*
	(3.307)	(2.988)	(11.549)	(20.457)
Bodily pain	-2.482	-1.627	-8.638	-7.374
	(2.128)	(2.050)	(5.540)	(9.603)
General health	-3.346**	-2.713**	-12.629**	-16.575*
	(1.446)	(1.370)	(5.178)	(9.075)
Vitality	-3.057*	-2.206	-11.557**	-13.075
	(1.689)	(1.461)	(5.838)	(9.533)
Social functioning	-4.316**	-3.481*	-12.278*	-15.123
	(2.082)	(2.048)	(7.236)	(12.946)
Role emotional	-11.987***	-10.891***	-24.975**	-27.300*
	(3.670)	(3.527)	(10.286)	(14.998)
Mental health	-4.613***	-17.068***	-3.387***	-18.241*
	(1.181)	(6.288)	(1.267)	(10.290)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the settlement of residence (443 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 10: Potential channels of adverse effects (settlement clustering)

Outcome	Probit estimates		Bivariate probit		IV estimates	
	(1)	(2)	(1)	(2)	(1)	(2)
No eating issues	0.006	0.001	-0.101	0.002	-0.163	-0.156
	(0.026)	(0.029)	(0.113)	(0.127)	(0.162)	(0.248)
No drinking issues	0.019*	0.012	0.177**	0.118	0.051***	0.033
	(0.010)	(0.010)	(0.077)	(0.090)	(0.016)	(0.021)
No smoking issues	-0.005	-0.016	-0.046	-0.071	-0.007	-0.099
	(0.020)	(0.020)	(0.069)	(0.066)	(0.073)	(0.084)
Physically active	0.035	0.017	0.056	0.112	0.078	0.097
	(0.024)	(0.024)	(0.098)	(0.120)	(0.103)	(0.142)
Labor active	-0.008	0.011	-0.141*	0.040	-0.151*	0.104
	(0.026)	(0.023)	(0.074)	(0.052)	(0.084)	(0.155)
Not widowed	-0.035	-0.009	-0.027	0.001	-0.047	0.135
	(0.022)	(0.021)	(0.071)	(0.069)	(0.082)	(0.099)
Married	0.005	-0.005	0.061	0.188	0.054	0.031
	(0.014)	(0.011)	(0.083)	(0.128)	(0.048)	(0.069)
Household income	-0.053	-0.009	-0.337***	-0.204*	-0.425***	-0.331**
	(0.033)	(0.031)	(0.059)	(0.117)	(0.092)	(0.154)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. Coefficients presented in probit and bivariate probit estimation are marginal effects. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the settlement of residence (443 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

Estimates excluding Vukovar-Syrmia county (VSC)

Table 11: War displacement effect (excl. VSC)

Outcome	Simple estimates		Bivariate probit		IV estimates	
	(1)	(2)	(1)	(2)	(1)	(2)
Healthy	-0.060**	-0.052**	-0.101	-0.074	-0.115	-0.039
	(0.028)	(0.023)	(0.101)	(0.102)	(0.140)	(0.158)
No systolic hypertension	-0.020	0.024	-0.264***	-0.116	-0.467***	-0.375***
	(0.053)	(0.046)	(0.095)	(0.114)	(0.153)	(0.098)
No diastolic hypertension	-0.106**	-0.073	-0.312***	-0.256**	-0.513***	-0.569***
	(0.049)	(0.045)	(0.069)	(0.107)	(0.137)	(0.168)
No tachycardia	-0.022	-0.003	-0.130	-0.091	-0.226	-0.228
	(0.054)	(0.052)	(0.114)	(0.226)	(0.160)	(0.251)
No obesity	0.018	0.043*	-0.040	0.124	-0.030	0.269*
	(0.028)	(0.026)	(0.122)	(0.111)	(0.134)	(0.148)
# chronic diseases	-0.292	-0.263	-	-	-0.700	-0.363
	(0.239)	(0.259)	-	-	(0.738)	(0.853)
Life satisfaction	-0.558***	-0.349**	-	-	-0.214*	0.145
	(0.176)	(0.163)	-	-	(0.120)	(0.121)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. Simple estimates refer to probit estimation for healthy, no systolic hypertension, no diastolic hypertension, no tachycardia and no obesity; and OLS estimates for the # of chronic diseases and life satisfaction. Coefficients presented in probit and bivariate probit estimation are marginal effects. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the pre-war county of residence level (20 clusters).

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 12: War displacement effects - SF-36 indicators (excl. VSC)

	OLS estimates		IV estimates	
	(1)	(2)	(1)	(2)
Physical functioning	-6.136**	-4.857**	-11.671	-6.174
	(2.906)	(2.227)	(8.174)	(4.722)
Role physical	-6.658	-4.147	-19.807*	-10.749
	(4.000)	(3.632)	(10.761)	(8.780)
Bodily pain	-2.572	-1.714	-8.068	-8.075
	(2.869)	(2.811)	(8.642)	(9.457)
General health	-2.950	-2.346	-5.754	-2.677
	(2.335)	(2.118)	(7.809)	(9.153)
Vitality	-3.401*	-2.815	-4.373	-2.732
	(1.840)	(1.651)	(6.332)	(7.696)
Social functioning	-4.831*	-3.970*	-13.942*	-20.483**
	(2.463)	(2.170)	(7.126)	(8.790)
Role emotional	-10.851***	-9.715***	-25.839***	-33.722***
	(3.453)	(3.380)	(9.467)	(12.587)
Mental health	-4.926***	-10.724*	-3.982**	-7.038
	(1.666)	(6.050)	(1.570)	(7.366)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the pre-war county of residence level (20 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 13: War displacement effect (excl. VSC - settlement clustering)

Outcome	Simple estimates		Bivariate probit		IV estimates	
	(1)	(2)	(1)	(2)	(1)	(2)
Healthy	-0.060**	-0.052*	-0.101	-0.074	-0.115	-0.039
	(0.029)	(0.028)	(0.110)	(0.110)	(0.130)	(0.146)
No systolic hypertension	-0.020	0.024	-0.264***	-0.116	-0.467***	-0.375**
	(0.034)	(0.031)	(0.096)	(0.135)	(0.158)	(0.191)
No diastolic hypertension	-0.106***	-0.073**	-0.312***	-0.256***	-0.513***	-0.569***
	(0.031)	(0.029)	(0.053)	(0.081)	(0.115)	(0.187)
No tachycardia	-0.022	-0.003	-0.130	-0.091	-0.226	-0.228
	(0.030)	(0.033)	(0.112)	(0.153)	(0.169)	(0.208)
No obesity	0.018	0.043*	-0.040	0.124	-0.030	0.269**
	(0.027)	(0.026)	(0.073)	(0.082)	(0.080)	(0.118)
# chronic diseases	-0.292	-0.263	-	-	-0.700	-0.363
	(0.241)	(0.203)	-	-	(0.596)	(0.690)
Life satisfaction	-0.558***	-0.349**	-	-	-0.214*	0.145
	(0.171)	(0.170)	-	-	(0.118)	(0.155)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. Simple estimates refer to probit estimation for healthy, no systolic hypertension, no diastolic hypertension, no tachycardia and no obesity; and OLS estimates for the # of chronic diseases and life satisfaction. Coefficients presented in probit and bivariate probit estimation are marginal effects. For all the outcomes a negative coefficient represents adverse an effect. Standard errors are clustered at the settlement of residence (438 clusters). Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 14: War displacement effects - SF-36 indicators (excl. VSC - settlement clustering)

	OLS estimates		IV estimates	
	(1)	(2)	(1)	(2)
Physical functioning	-6.136***	-4.857***	-11.671*	-6.174
	(2.281)	(1.844)	(6.200)	(6.703)
Role physical	-6.658*	-4.147	-19.807**	-10.749
	(3.836)	(3.386)	(9.099)	(10.270)
Bodily pain	-2.572	-1.714	-8.068	-8.075
	(2.477)	(2.324)	(6.274)	(8.236)
General health	-2.950*	-2.346	-5.754	-2.677
	(1.603)	(1.528)	(5.279)	(6.159)
Vitality	-3.401*	-2.815*	-4.373	-2.732
	(1.965)	(1.664)	(5.334)	(6.904)
Social functioning	-4.831**	-3.970*	-13.942**	-20.483**
	(2.433)	(2.298)	(5.681)	(9.217)
Role emotional	-10.851***	-9.715***	-25.839**	-33.722**
	(3.722)	(3.730)	(10.052)	(14.587)
Mental health	-4.926***	-10.724**	-3.982***	-7.038
	(1.336)	(4.504)	(1.420)	(5.777)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. For all the outcomes negative a coefficient represents an adverse effect. Standard errors are clustered at the settlement of residence (438 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

Estimates excluding counties that had less than 0.5% of civilian casualties

Table 15: War displacement effect (excl. $< 0.5\%$)

Outcome	Simple estimates		Bivariate probit		IV estimates	
	(1)	(2)	(1)	(2)	(1)	(2)
Healthy	-0.058**	-0.067***	-0.418***	-0.416***	-0.547***	-0.621***
	(0.022)	(0.021)	(0.053)	(0.044)	(0.116)	(0.111)
No systolic hypertension	0.041	0.025	-0.228***	-0.406***	-0.299***	-0.659***
	(0.041)	(0.044)	(0.078)	(0.047)	(0.100)	(0.109)
No diastolic hypertension	-0.030	-0.041	-0.065	-0.426***	-0.167	-0.675***
	(0.055)	(0.049)	(0.111)	(0.064)	(0.123)	(0.119)
No tachycardia	-0.039	-0.041	-0.297**	-0.439***	-0.270**	-0.508**
	(0.061)	(0.064)	(0.118)	(0.099)	(0.138)	(0.248)
No obesity	0.050*	0.050*	-0.035	0.061	-0.056	0.058
	(0.030)	(0.030)	(0.128)	(0.116)	(0.156)	(0.116)
# chronic diseases	-0.144	-0.223	-	-	-0.436	-0.953**
	(0.253)	(0.231)	-	-	(0.343)	(0.448)
Life satisfaction	-0.360**	-0.378**	-	-	-0.262**	-0.256***
	(0.140)	(0.146)	-	-	(0.117)	(0.095)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. Simple estimates refer to probit estimation for healthy, no systolic hypertension, no diastolic hypertension, no tachycardia and no obesity; and OLS estimates for the # of chronic diseases and life satisfaction. Coefficients presented in probit and bivariate probit estimation are marginal effects. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the pre-war county of residence level (12 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 16: War displacement effect - SF-36 indicators (excl. $< 0.5\%$)

	OLS estimates		IV estimates	
	(1)	(2)	(1)	(2)
Physical functioning	-4.001	-4.382*	-12.436***	-10.150***
	(2.521)	(2.183)	(4.439)	(2.608)
Role physical	-4.500	-4.502	-43.208***	-42.181***
	(3.499)	(3.649)	(8.788)	(6.143)
Bodily pain	-1.977	-2.207	-10.905**	-6.833
	(2.617)	(2.534)	(4.667)	(8.968)
General health	-2.801	-3.205	-19.600***	-16.856***
	(1.845)	(1.882)	(3.823)	(3.771)
Vitality	-2.272	-2.414	-17.574***	-17.732***
	(1.687)	(1.669)	(4.009)	(4.591)
Social functioning	-3.634	-4.245*	-14.369***	-19.825***
	(2.252)	(2.081)	(5.305)	(5.695)
Role emotional	-10.280**	-10.943**	-29.055***	-27.751***
	(3.310)	(3.617)	(3.660)	(6.937)
Mental health	-3.524**	-21.460***	-3.924**	-21.479***
	(1.453)	(2.927)	(1.640)	(5.194)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the pre-war county of residence level (12 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 17: War displacement effect (excl. $< 0.5\%$ - settlement clustering)

Outcome	Simple estimates		Bivariate probit		IV estimates	
	(1)	(2)	(1)	(2)	(1)	(2)
Healthy	-0.058*	-0.067**	-0.418***	-0.416***	-0.547***	-0.621**
	(0.030)	(0.027)	(0.117)	(0.085)	(0.281)	(0.292)
No systolic hypertension	0.041	0.025	-0.228***	-0.406***	-0.299**	-0.659**
	(0.032)	(0.030)	(0.087)	(0.055)	(0.138)	(0.278)
No diastolic hypertension	-0.030	-0.041	-0.065	-0.426***	-0.167	-0.675*
	(0.036)	(0.031)	(0.131)	(0.081)	(0.197)	(0.352)
No tachycardia	-0.039	-0.041	-0.297*	-0.439***	-0.270	-0.508**
	(0.033)	(0.035)	(0.161)	(0.090)	(0.179)	(0.244)
No obesity	0.050*	0.050*	-0.035	0.061	-0.056	0.058
	(0.028)	(0.026)	(0.112)	(0.131)	(0.139)	(0.137)
# chronic diseases	-0.144	-0.223	-	-	-0.436	-0.953
	(0.196)	(0.165)	-	-	(0.707)	(0.739)
Life satisfaction	-0.360**	-0.378**	-	-	-0.262	-0.256
	(0.170)	(0.161)	-	-	(0.183)	(0.173)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. Simple estimates refer to probit estimation for healthy, no systolic hypertension, no diastolic hypertension, no tachycardia and no obesity; and OLS estimates for the # of chronic diseases and life satisfaction. Coefficients presented in probit and bivariate probit estimation are marginal effects. For all the outcomes a negative coefficient represents an adverse effect. Standard errors are clustered at the settlement of residence (210 clusters). Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 18: War displacement effect - SF-36 indicators (excl. $< 0.5\%$ - settlement clustering)

	OLS estimates		IV estimates	
	(1)	(2)	(1)	(2)
Physical functioning	-4.001*	-4.382***	-12.436	-10.150
	(2.062)	(1.634)	(13.261)	(10.568)
Role physical	-4.500	-4.502	-43.208*	-42.181**
	(3.611)	(3.043)	(22.914)	(21.315)
Bodily pain	-1.977	-2.207	-10.905	-6.833
	(2.263)	(2.050)	(10.114)	(10.133)
General health	-2.801*	-3.205**	-19.600*	-16.856*
	(1.582)	(1.404)	(10.330)	(8.945)
Vitality	-2.272	-2.414	-17.574	-17.732*
	(1.786)	(1.504)	(11.705)	(10.659)
Social functioning	-3.634	-4.245**	-14.369	-19.825
	(2.277)	(2.078)	(13.234)	(13.375)
Role emotional	-10.280***	-10.943***	-29.055	-27.751*
	(3.932)	(3.471)	(17.955)	(14.282)
Mental health	-3.524***	-21.460*	-3.924***	-21.479**
	(1.350)	(12.054)	(1.271)	(10.660)

Note: Each coefficient is the effect of displacement on a different outcome variable. Model (1) is without covariates, while model (2) includes 4-year age group dummies, education dummies, NUTS2 dummies of pre-war residence, pre-war county unemployment rate and GDP per capita. For all the outcomes a negative coefficient an represents adverse effect. Standard errors are clustered at the settlement of residence (210 clusters).
Significance levels : $*$: 10% $**$: 5% $***$: 1%