Conflict, Casualties, and Care: Impact of
Conflict Mortality on the Gendered Burden of Support

Yvette Young,[1] Enrique Acosta,[1,2] Diego Alburez-Gutierrez,[1] Emilio Zagheni[1]

[1] Max Planck Institute for Demographic Research
[2] Centre for Demographic Studies (CED), Barcelona, Spain

Abstract:
Among contemporary studies of armed conflict and mortality, attention to the downstream effects on population structures, particularly dependency ratios and their implications after war, is lacking. Using data from the United Nations' World Population Prospects, we estimate the excess war-related mortality incurred during war and project the impact of this mortality on the gender distribution of dependent and supportive populations. We begin by analyzing Rwanda, which experienced a civil war, punctuated by acute mortality during a brief genocide. Using a cohort component model, we construct a counterfactual population scenario in which the civil war and genocide did not occur. Based on the difference between our observed and counterfactual scenarios we estimate the age-sex distribution of mortality, followed by estimating the feminization of kin. More feminized kin structures are seen for a 50-year span beyond the end of the conflict. This implies an increase in the feminized burden of support, which carries the potential for heightened levels of stress and elevated risk of stress-related physical and mental disease among the predominantly female, supportive population. Increasing care burdens for one population segment may also result in declines in the volume or quality of care and support provided to the dependent population. As a result, the implications of changes to the population structure, especially to gender-disaggregated dependency ratios, are far-reaching for the health and continuity of the entire population.

INTRODUCTION

In the media and the popular imagination, war conjures dramatic images of crumbling buildings, mangled bodies, and grieving families. The immediate humanitarian needs portrayed in these images garner global attention and assistance, while the longer-term social, institutional, and demographic consequences often go unnoticed in the public consciousness. Critically, the excess mortality generated by armed conflict shifts the overall population structure with important implications for the required and available support to and dependency of the child and older adult populations.

Dependency is traditionally defined in the economic sense, where a dependency ratio comprises the number of economically dependent people per 100 economically productive people. However, dependency also implies unpaid labor in the form of care requirements to offset gaps in public systems of social support. Economically and demographically speaking, dependents are children (under age 15) and older adults (aged 65 and older) (Ronald D. Lee, 1994). While demographic theories tend to conceptualize the temporal pace of demographic change as slow, taking decades or generations to shift overall population patterns, migration events, pandemics, natural disasters, and wars can rapidly shift population structures (Billari, 2022). Armed conflict, in particular, has immediate consequences for both migration and mortality (Adhikari, 2013; Jawad et al., 2020; Williams et al., 2021), both of which redistribute populations, restructure dependency ratios, and alter the populations' social support requirements.

The characteristics of war, where civilians are considered "inappropriate" targets of war (Grotius, 1625; Kinsella, 2006), generate a gendered imbalance in war-related mortality. Soldiers tend to be young adults, predominantly male, in the early to middle years of their productive work lives. Despite the increasing participation of women in militaries globally, militaries remain predominantly male (Alexievich, 2017; Goldstein, 2003; Sjoberg, 2014), and patterns of elevated male mortality have been documented in the recent

conflicts in Gaza (Jamaluddine et al., 2023)and Ukraine (Haque et al., 2022; Kulu et al., 2022). In contexts of genocide, notions of ethical targets are disregarded, and all members of the population are potential targets. While the distribution of deaths is more representative of the population structure than in traditional wars, mortality still skews male. Consequently, conflict-related excess mortality generally increases the dependency ratio, particularly the dependence on women, whether the conflict is a war or a genocide.

Estimating the burden of dependency requires thinking critically about our definition of dependency and the embedded assumptions about our social structure. What does it mean to be "unproductive," and are our age-based assumptions about productivity reflective of the care and unpaid labor contributions of the population? Standard age-based measures and even gender-age-based measures reflect specific social structures and typically overlook non-labor market social transfers such as household labor and caregiving (Calasanti & Bonanno, 1986). In the caregiving realm, survey research generally finds that women undertake a greater share of the labor than men and for a longer portion of their life span (Ahmad & Shah, 2021; Istenič et al., 2018; Ophir & Polos, 2022; Patterson & Margolis, 2019). Additionally, in many contexts, girls are responsible for caregiving tasks before the age of 15, and grandmothers continue to provide care well past the age of 64. When considering other household labor, the balance of labor varies across sociocultural contexts (Ervin et al., 2022). Societies with egalitarian gender ideologies, especially those with robust social welfare and support systems, tend to have more egalitarian distributions of household labor (Kleider, 2015; McMunn et al., 2020; Nordenmark, 2004). However, even in the most egalitarian contexts, the "second shift"— household labor after the end of the labor market workday—more commonly falls to women.

In contexts of conflict, where excess mortality skews male, the "supportive population"[1] shouldering the escalating burden of care and unpaid labor is disproportionately female. Moreover, in conflict contexts where the traditional labor market is disrupted, it is not only the "missing men" that increase the household burden, but the shift from market-based to household means of subsistence that potentially increases the gendered burden of support. However, this shift is far more challenging to estimate. Finally, the increased burden of support incurred by women in contexts of armed conflict potentially affects mental health and well-being (Dukhovnov et al., 2022; Ervin et al., 2022; Fang, 2022; Labbas & Stanfors, 2023), which, in turn, affect women's physical health and longevity (Plümper & Neumayer, 2006). In the analyses presented below, we estimate the excess war-related mortality and its impact on family structures to understand the implications women's supportive labor.

METHODS
To estimate the effect of conflict-related mortality on dependency and the burden of support, we rely on the World Population Prospects (WPP) data published by the United Nations. We retrieved age- and gender-specific mortality rates, fertility rates, and estimates of population projections from the WPP 2024 Revisions. These data provide a baseline scenario, i.e., the observed population during the pre-conflict, conflict, and post-conflict recovery periods. To estimate excess mortality, we create a counterfactual scenario in which we remove conflict-related distortions in the three demographic components. We use a cohort component projection model to interpolate trends in mortality and fertility from 1987 to 2001 based on observed trends and historical context. We assume zero net migration during the conflict period and return migration during the post-conflict recovery, which we assume is a return of those forcibly displaced.

Estimation of counterfactual populations in contexts where conflicts are ongoing, such as Palestine, Ukraine, and Ethiopia, requires strong uninformed assumptions about the conflict-related changes in fertility and migration, and moderately informed assumptions about mortality. To minimize the number of assumptions required for this analysis, we chose to look at Rwanda, where the civil war and genocide were relatively short-term and acute. The historical nature of the conflict allows us to see the actual changes in mortality, fertility, and migration during the conflict and the "recovery" patterns after the conflict. Given the short-term of the

---

[1] We use the term "supportive population" rather than "working-age population" to account for both market-based labor and non-market social support, such as household labor and caregiving.

crisis, we can assume that by removing demographic disturbances during the crisis generates a counterfactual scenario of no conflict.

Reflecting the assertion that age-based measures of dependency are insufficient to account for family adaptations during crises, we base our estimates of the gendered burden of support on family structures. Thus, in the second stage of our analysis, we estimate the average family structure for both the observed and counterfactual scenarios using annual age- and gender-specific average kinship structures based on mathematical models of kinship. These models quantify the number of relatives, by age and sex, and use sex- and age-specific survival probabilities and fertility rates to estimate the average number of living kin for an average member of the population (Goodman & Keyfitz, 1974). Next, we compute a measure of the gender distribution of kin for children at ages 0, 5, and 15.

RESULTS

The civil war in Rwanda began in 1990 and lasted for four years. The genocide lasted only 100 days from April to July of 1994. However, the majority of the killings occurred during the first 6 weeks. By some estimates, as many as 800,000 Tutsi's were killed. The spike in mortality above the civil war mortality was dramatic (Figure 1). However, the excess mortality attributable to the conflict and the genocide is contested (McDoom 2020, Verpoorten 2020). Moreover, though the civil war has a defined start and end, mortality disturbances can be seen for a short time preceding the war and for roughly 5 years after the genocide's conclusion with the most dramatic disturbances, as expected, visible during the genocide (Figure 2).

Figure 1. Rwandan mortality rates over time
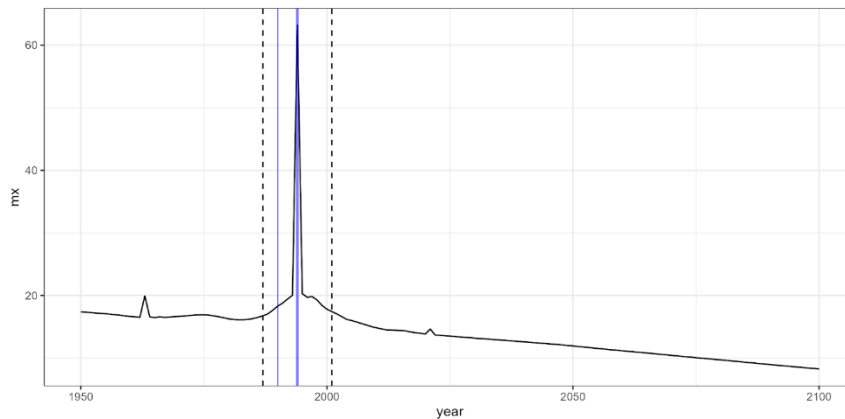
Figure 2. Age-sex distribution of Rwandan mortality by year
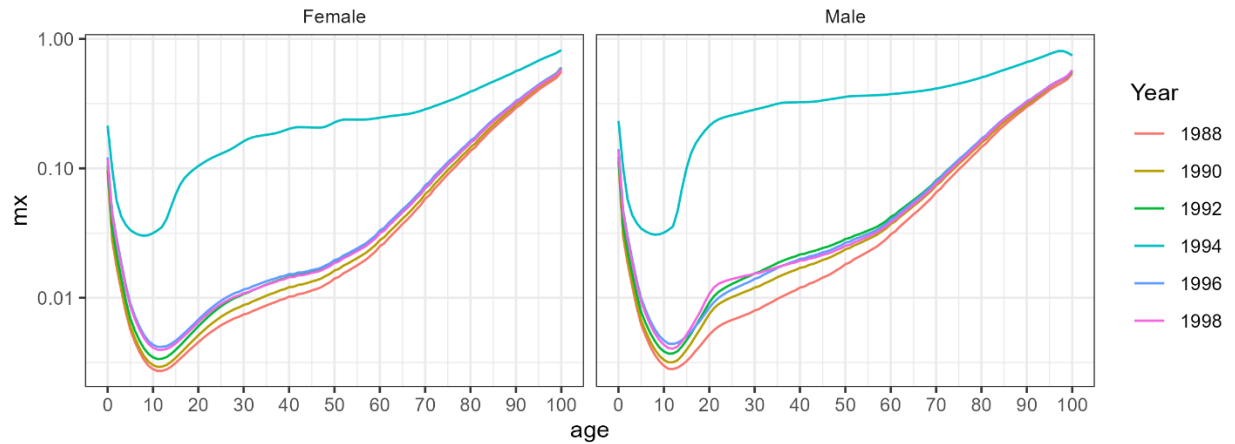
Our counterfactual estimate of mortality, fertility, and migration is shown in Figure 3. The blue shaded area marks the period of civil war (1990-1994), which ends with the genocide in 1994. The dashed lines indicate the period used to generate the counterfactual. For mortality and fertility, we interpolate the period from 1987 to 2001; for migration the period 1987 to 2003. The extended interpolation period for migration is intended to capture the return of forcibly displaced people.

Figure 3. Observed and counterfactual mortality scenarios
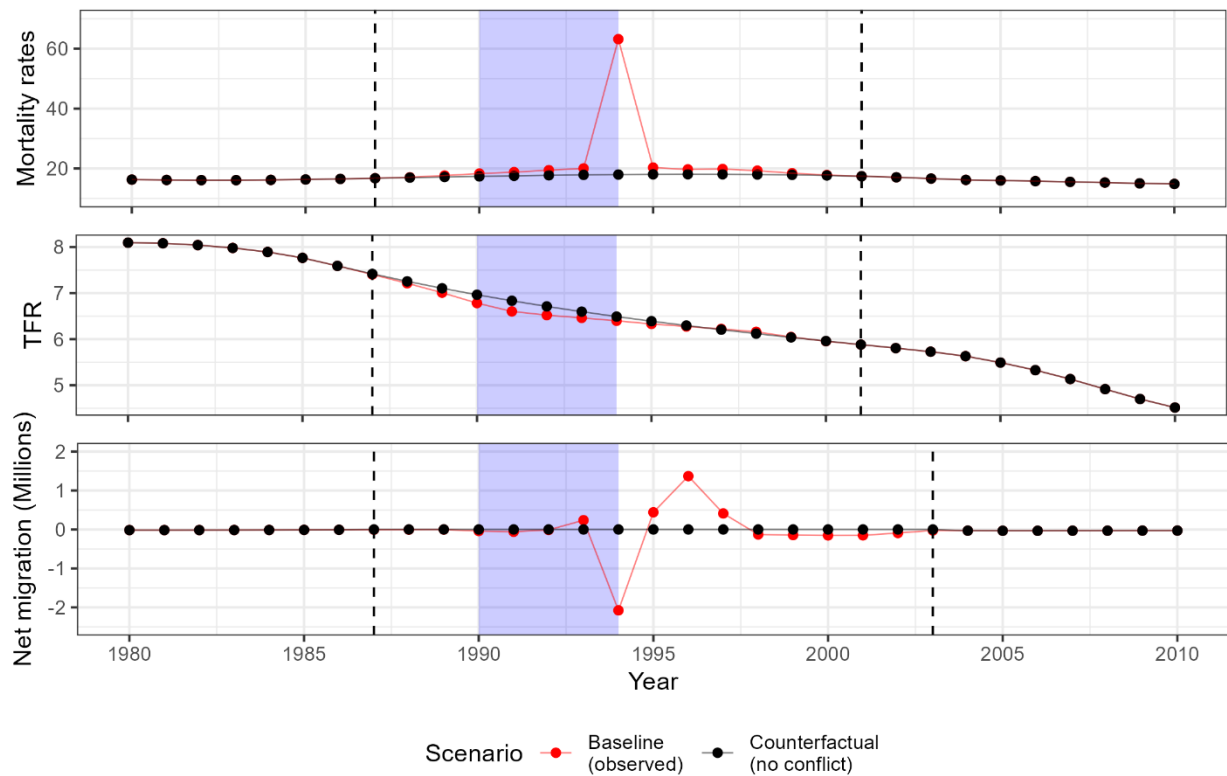
Based on the observed data and the estimated counterfactual scenarios in which conflict did not occur, we next estimated the annual age and sex-specific estimates of kinship structure using demographic kinship models (Goodman & Keyfitz, 1974). These models quantify the number of relatives by age and sex using age-specific survival probabilities and fertility rates to estimate the average number of living kin for a focal average

member of the population. For example, for a focal person aged 15, how many older siblings, parents, grandparents, and ancestors do they have. We use this information to compute a measure of the gender distribution of supportive kin, which we operationalize as the share of all living parents for a child who are women. In other words, if a 15-year-old child has, on average, 0.9 living mothers and 0.8 living fathers, then .9/(.9+.8)=53% of her living parents, on average, are mothers. Figure 4 shows the absolute and relative differences in male and female supportive kin by type of kinship relation. We see a high feminization of kin in the immediate aftermath of the genocide, with a return to normal rates by 2050.

Figure 4. Difference in the average number of female versus male kin
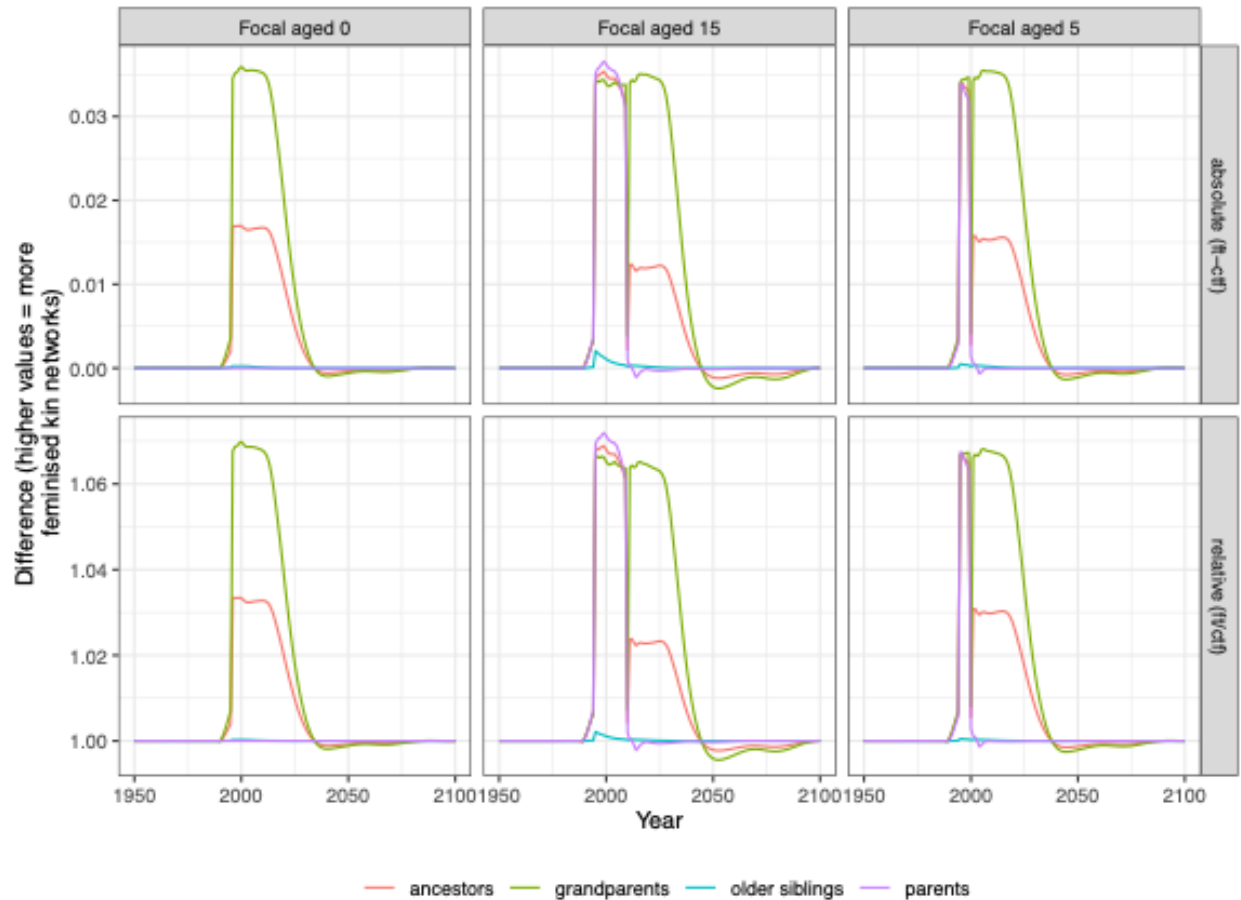
When displayed as sex ratios for focal dependents aged 0, 5, and 15, we see that the feminization of parents is confined to a 20-year period, while the feminization of grandparents endures for 50 year (see Figure 5). The magnitude of the shift is approximately four percentage points. In other words, the ratio of mothers to fathers for an average focal individual is 0.51 in the absence of the genocide, but 0.54 in the observed data. Though the shift due to genocide is small, it is important to remember that mortality in genocides is somewhat more evenly distributed across the population than in traditional wars. The magnitude of the feminization of grandparents is similar, but the feminization persists for longer. The feminization of supportive kin due to genocide implies an increase in the support burden for women.

Figure 5. Change in dependency ratios by dependent population

Model — ctf — ft
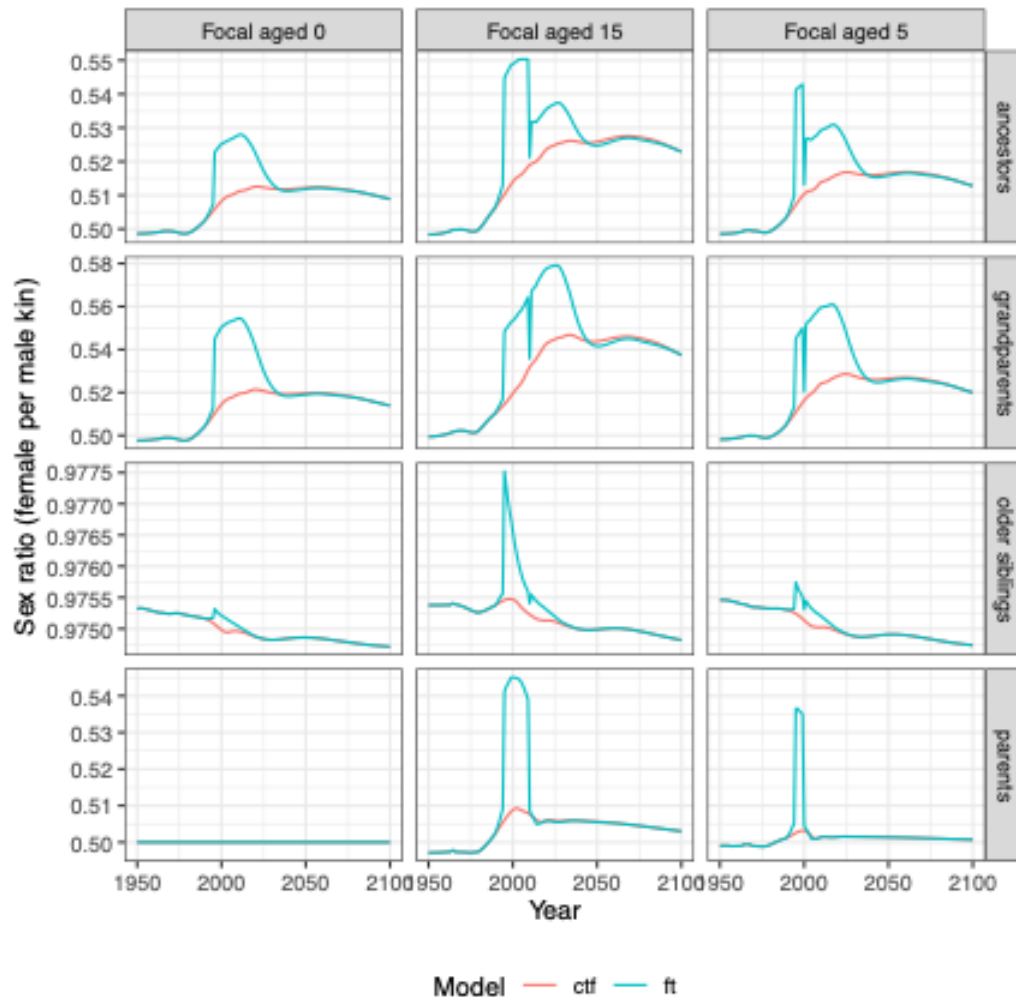
DISCUSSION

Relative to other population shocks, such as disasters and pandemics, conflict contexts are unique in their effect on dependency ratios and social support. War-related mortality predominantly affects men of "productive" working age. Similarly, genocides affect male mortality more than female mortality, but the gender differences in mortality are diminished relative to the mortality of traditional wars due to the undiscriminating nature of the genocidal violence. Other population shocks such as environmental disasters or pandemic are more egalitarian in their distribution. Our analyses demonstrated a small but meaningful shift in the sex-ratio of the supportive population due to the Rwandan genocide of 1994. In this paper, we adopt a nontraditional definition of the supportive population. Rather than employing age-specific thresholds between "productive" and "dependent" populations based largely on the labor market ages, we exploit kinship models to also account for unpaid labor. Caregiving by grandparents and older siblinwgs, who might be considered dependents when using an age-based definition, is an adaptive response to population shocks. Further, in many contexts, caregiving is predominantly a female task. Thus, the feminization of supportive kin results in an increased burden of supportive labor for women, inclusive of wage labor, subsistence labor, and care-giving.

To compensate for the increased burden on women in such circumstances, Hammer et al. (2015) suggest balancing shifts in the dependency ratio by increasing women's participation in paid labor, thus restoring

economic contributions to institutions of social support. However, in conflict contexts, even after rebuilding has begun, institutional support is typically lacking or reduced, rendering this type of approach ineffective. Other scholars note that the societal impacts of sudden shifts in the dependency ratio diminish when worker productivity is higher (Verdugo, 2007). Such logic fails when considering unpaid labor. The elevated burden of support exacts a toll on the mental health of the feminized supportive population, that persists long past the conflict's end. The psychological toll of this conflict-induced increase in women's supportive labor may also impact the dependent children in the form of poorer quality of care. This latter point is a critical one. Though the disruption to the population structure and structures of dependency are short-lived in terms of populations (spanning only half a century), the potential intergenerational consequences of the feminization of support, specifically the psychological toll on the supportive population and their dependents endures long beyond the population disruptions.

REFERENCES

Adhikari, P. (2013). Conflict-Induced Displacement, Understanding the Causes of Flight. *American Journal of Political Science*, *57*(1), 82–89. https://www.jstor.org/stable/23496544

Ahmad, D., & Shah, S. Z. A. (2021). Impact of Dependency Ratio on Economic Growth among Most Populated Asian Countries. *Journal of Development and Social Sciences*, *2*(4), 563–579. https://doi.org/10.47205/jdss.2021(2-IV)47

Alexievich, S. A. (2017). *The Unwomanly Face of War* (L. Volokhonsky & R. Pevear, Trans.). Random House Publishing Group.

Billari, F. C. (2022). Demography: Fast and Slow. *Population and Development Review*, *48*(1), 9–30. https://doi.org/10.1111/padr.12464

Calasanti, T. M., & Bonanno, A. (1986). The social creation of dependence, dependency ratios, and the elderly in the United States: A critical analysis. *Social Science & Medicine*, *23*(12), 1229–1236. https://doi.org/10.1016/0277-9536(86)90285-6

Dukhovnov, D., Ryan, J. M., & Zagheni, E. (2022). "The Impact of Demographic Change on Transfers of Care and Associated Well-being." *Population Research and Policy Review*, *41*(6), 2419–2446. https://doi.org/10.1007/s11113-022-09736-0

Ervin, J., Taouk, Y., Alfonzo, L. F., Hewitt, B., & King, T. (2022). Gender differences in the association between unpaid labour and mental health in employed adults: A systematic review. *The Lancet Public Health*, *7*(9), e775–e786. https://doi.org/10.1016/S2468-2667(22)00160-8

Fang, D. (2022). The Effect of Household Dependency Ratio on the Mental Health of Workforce: Evidence From China. *Frontiers in Public Health*, *10*, 848114. https://doi.org/10.3389/fpubh.2022.848114

Goldstein, J. S. (2003). War and Gender. In C. R. Ember & M. Ember (Eds.), *Encyclopedia of Sex and Gender: Men and Women in the World's Cultures* (pp. 107–116). Kluwer Academic/Plenum Publishers.

Goodman, L. A., & Keyfitz, N. (1974). Family formation and the frequency of various kinship relationships. *Theoretical Population Biology*, *5*(1), 1–27. https://doi.org/10.1016/0040-5809(74)90049-5

Grotius, H. (1625). *The Law of War and Peace* (F. W. Kelsey, Trans.; 2005th ed.). Lonang Institute. https://lonang.com/wp-content/download/Grotius-LawOfWarAndPeace.pdf

Hammer, B., Prskawetz, A., & Freund, I. (2015). Production activities and economic dependency by age and gender in Europe: A cross-country comparison. *The Journal of the Economics of Ageing*, *5*, 86–97. https://doi.org/10.1016/j.jeoa.2014.09.007

Haque, U., Naeem, A., Wang, S., Espinoza, J., Holovanova, I., Gutor, T., Bazyka, D., Galindo, R., Sharma, S., Kaidashev, I. P., Chumachenko, D., Linnikov, S., Annan, E., Lubinda, J., Korol, N., Bazyka, K., Zhyvotovska, L., Zimenkovsky, A., & Nguyen, U.-S. D. T. (2022). The human toll and humanitarian

crisis of the Russia-Ukraine war: The first 162 days. *BMJ Global Health*, *7*(9), e009550. https://doi.org/10.1136/bmjgh-2022-009550

Istenič, T., Ograjenšek, I., & Sambt, J. (2018). The gender gap in economic dependency over the life cycle: Some theoretical and practical considerations. *Economic Research-Ekonomska Istraživanja*, *31*(1), 188–205. https://doi.org/10.1080/1331677X.2018.1426479

Jamaluddine, Z., Checchi, F., & Campbell, O. M. R. (2023). Excess mortality in Gaza: Oct 7–26, 2023. *The Lancet*, *402*(10418), 2189–2190. https://doi.org/10.1016/S0140-6736(23)02640-5

Jawad, M., Hone, T., Vamos, E. P., Roderick, P., Sullivan, R., & Millett, C. (2020). Estimating indirect mortality impacts of armed conflict in civilian populations: Panel regression analyses of 193 countries, 1990–2017. *BMC Medicine*, *18*(1), 266. https://doi.org/10.1186/s12916-020-01708-5

Kinsella, H. M. (2006). Gendering Grotius: Sex and Sex Difference in the Laws of War. *Political Theory*, *34*(2), 161–191. https://doi.org/10.1177/0090591705279530

Kleider, H. (2015). Paid and unpaid work: The impact of social policies on the gender division of labour. *Journal of European Social Policy*, *25*(5), 505–520. https://doi.org/10.1177/0958928715610996

Kulu, H., Christison, S., Liu, C., & Mikolai, J. (2022). *The War and the Future of Ukraine's Population* (Working Paper 9; Migrant Life). University of St. Andrews. https://migrantlife.wp.st-andrews.ac.uk/files/2022/03/The-War-and-the-Future-of-Ukraines-Population.pdf

Labbas, E., & Stanfors, M. (2023). Does Caring for Parents Take Its Toll? Gender Differences in Caregiving Intensity, Coresidence, and Psychological Well-Being Across Europe. *European Journal of Population*, *39*(1), 18. https://doi.org/10.1007/s10680-023-09666-3

McMunn, A., Bird, L., Webb, E., & Sacker, A. (2020). Gender Divisions of Paid and Unpaid Work in Contemporary UK Couples. *Work, Employment and Society*, *34*(2), 155–173. https://doi.org/10.1177/0950017019862153

Nordenmark, M. (2004). Does gender ideology explain differences between countries regarding the involvement of women and of men in paid and unpaid work? *International Journal of Social Welfare*, *13*(3), 233–243. https://doi.org/10.1111/j.1369-6866.2004.00317.x

Ophir, A., & Polos, J. (2022). Care Life Expectancy: Gender and Unpaid Work in the Context of Population Aging. *Population Research and Policy Review*, *41*(1), 197–227. https://doi.org/10.1007/s11113-021-09640-z

Patterson, S. E., & Margolis, R. (2019). The Demography of Multigenerational Caregiving: A Critical Aspect of the Gendered Life Course. *Socius*, *5*, 2378023119862737. https://doi.org/10.1177/2378023119862737

Plümper, T., & Neumayer, E. (2006). The Unequal Burden of War: The Effect of Armed Conflict on the Gender Gap in Life Expectancy. *International Organization*, *60*, 723–754. https://doi.org/10.1017/S0020818306060231

Ronald D. Lee. (1994). The Formal Demography of Population Aging, Transfers, and the Economic Life Cycle. In L. G. Martin & S. H. Preston (Eds.), *Demography of Aging*. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK236666/

Sjoberg, L. (2014). *Gender, War, and Conflict*. John Wiley & Sons.

Verdugo, R. R. (2007). Workers, workers' productivity and the dependency ratio in Germany: Analysis with implications for social policy. *Population Research and Policy Review*, *25*(5–6), 547–565. https://doi.org/10.1007/s11113-006-9015-4

Williams, N. E., O'Brien, M. L., & Yao, X. (2021). How Armed Conflict Influences Migration. *Population and Development Review*, *47*(3), 781–811. https://doi.org/10.1111/padr.12408