

Weaponized or compromised Ukrainian nuclear power plants as bioterrorism: AI driven Computational Ethics, health equity, and cost effectiveness analysis of prevention and response

Plantas de energía nuclear ucranianas en peligro de ser usadas como armas de bioterrorismo: ética computacional, equidad en salud y análisis de la rentabilidad en la prevención y respuesta impulsadas por IA

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Abstract

The February 2022 Russian invasion of Ukraine has resulted in the first 10 days of war in what the United Nations described as the fastest growing humanitarian crisis since World War II and the first military attack on an active nuclear power plant. This analysis presents the first known AI driven Computational Ethics (AICE), health equity, and cost effectiveness analysis (CEA) of prevention of and response to nuclear terrorism as bioterrorism (amid mounting global concern for the use of deliberate tactical nuclear weapons). It addresses the risk of false flag operations to sabotage and thus weaponize a Ukrainian power plant, and the related scenario of continued assault and occupation resulting in accidental plant compromise, with the similar outcome in both scenarios of nuclear meltdown as a potentially Europe-wide health, humanitarian, and ecological crisis. Using widely accepted and available data, methodologies, and assumptions, this computational analysis demonstrates that prevention of such bioterrorism on average would produce net savings of \$306.2 trillion overall, in addition to \$493.7 trillion saves in otherwise explosive related health inequities. Given these data inputs, computational ethical analysis suggests the substantive multicultural convergence from the world's diverse belief systems (including Buddhism, Christianity, Confucianism, Hinduism, Islam, Judaism, and secularism) that dignity, rights, and justice require prevention of such bioterrorism and prompt conclusion of this conflict as the most effective and urgent health system and public health responses to this crisis.

Keywords: Ukraine war, bioterrorism, Artificial Intelligence (AI) ethics, equity, cost effectiveness, nuclear terrorism.

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1. Introduction

The February 2022 Russian invasion of Ukraine eclipsed the COVID-19 pandemic as the 21st century's most radical and urgent challenge to modern healthcare and public health (1). The Editor-in-Chief of *The Lancet* within the first week of war quoted the United Nations (UN) millennium report by the Nobel Prize economist and former UN High Commissioner for Refugees to argue that human security is the bedrock of healthcare and public health, for there is no health if there is not first life, and there is no life if there is not first human security (which respects the intrinsic and inviolable dignity of every person) (2, 3, 4). In just the first 10 days of the conflict, the United Nations (UN) declared the war has already triggered «the fastest growing refugee crisis in Europe since World War II», with nearly 2 million civilians from Ukraine, Europe, Africa, the Middle East, Asia, and the Americas fleeing Ukraine (5). Thousands of social media videos and media reports and numerous world leaders (including the US President and Secretary of State and United Kingdom [UK] Prime Minister) increasingly assert the Russian military is committing a rapidly growing number of war crimes to «bombard cities into submission» through «slow annihilation» (6, 7, 8, 9, 10). Such evidence detail Russian forces deliberately destroying civilian infrastructure (including the energy grid required to keep civilians from freezing to death), hospitals, schools, and homes resulting in upwards of thousands of civilian casualties (including scores of children) in their homes, shelters, and evacuation routes to supposedly undermine the Ukrainian will of resistance in just the first weeks of the invasion (11, 12, 13). The World Health Organization (WHO) verified at least 16 Russian assaults on healthcare facilities in the first two weeks, killing at least 9 healthcare workers caring for the sick and injured (14). Such graphic details prompted 39 nations to petition the International Criminal Court (ICC) to investigate Russia's possible war crimes, leading to the ICC declaring that the robust preliminary evidence demonstrate «reasonable basis» such

crimes are occurring, and so allowing the ICC to immediately proceed with its formal investigation (15). Concurrently, 141 nations with historic unity in a joint UN resolution condemned the Russian invasion as an unprovoked attempt to seize control of another sovereign nation, regardless of the resultant humanitarian catastrophe (1, 16).

The WHO, UN, European Union (EU), US, and dozens of nations globally are rushing to supply Ukrainian hospitals and civilian communities under increasing assault and siege by the Russian military. Yet no substantive discussion has occurred for the prevention and response to the increasing threat of related nuclear catastrophe, the most severe and urgent continental health threat currently. The United States (US) ambassador to the United Nations (UN) on March 4, 2022, solemnly declared to the UN Security Council, «By the grace of God, the world narrowly averted a nuclear catastrophe last night» (17). These comments followed Russia's heavy artillery assault on Ukraine's Zaporizhzhia nuclear power plant which subsequently set the facility ablaze (with sustained Russian artillery shelling initially preventing Ukrainian firefighters from even approaching the station for multiple hours). A Ukrainian nuclear power operator noted that the Zaporizhzhia plant's civilian staff are working at «gunpoint», which the International Atomic Energy Agency (IAEA) urgently pleaded is «a situation that is very difficult to sustain, very fragile» (18). This is humanity's first military attack on an operating nuclear power plant (which the United States Embassy in Ukraine denounced as a Russian «war crime» as part of a «reign of terror», and the Ukrainian president alleged was «nuclear terror») (19, 20). This event was followed by the March 9th incident in which Ukraine's state energy company which runs its plants including Chernobyl reported that the occupying Russian military force caused Chernobyl to lose electrical power (required to cool the nuclear fuel to prevent its evaporation and possible escape from the plant and dissemination potentially throughout Europe) (21).

There are mounting international concerns about the increasingly plausible scenario of Russian false flag bioterrorism operation

to sabotage and thus weaponize at least one Ukrainian power plant under Russian military occupation (given the significant mounting pressure within the Russian military to eliminate Western-backed Ukraine defenses that have significantly stalled the intended conquest and occupation of the otherwise growing defense and insurgency, even at the cost of making the larger regional uninhabitable for an extended period). As noted by Interpol, «bioterrorism» historically has referred to toxin, viral, and bacterial agents utilized to harm people, yet its technical definition also encompasses «other harmful agents,» which can include nuclear agents that can be significantly more dangerous and widespread than the above agents despite the limited research in such scenarios. The related scenario with a similar expected outcome of nuclear meltdown would be continued Russian attacks against and occupation of civilians and civilian infrastructure, leading accidentally to nuclear plant compromise. This analysis presents the first known AI Driven Computational Ethics (AICE), equity, and Cost Effectiveness Analysis (CEA) for prevention of and response to this new modern development of nuclear terrorism as bioterrorism. Prior related research has demonstrated proof-of-concept for bioterrorism cost analyses to guide preparation and response (22, 23, 24), yet none have been extended to nuclear terrorism, nor integrated ethical analyses or AI despite the unique demonstrated utility of their complementary insights (25, 26). This paper therefore seeks to present a non-political, non-partisan data-driven approach to inform optimized health policies for patients regardless of nationality, amid this unprecedented challenge to health systems, patient security, and human rights.

2. Methods

2.1. *Epidemiological and economic inputs*

The study model was based on the best available epidemiological data on prior nuclear disasters including the Soviet Union's Cher-

nobyl (with at least 10 million exposed, 350,000 people evacuated and \$700 billion total costs) and Japan's Fukushima (with at least 32 million exposed, 154,000 evacuated, and \$202.5 billion total costs) (27, 28, 29, 30). The above costs principally reflect individual costs for clean-up and decontamination, but also entail evacuation, relocation, emergency response, and medical treatment (31). The IAEA estimates for the average fuel burn up for the Zaporizhzhia plant nuclear fuel is 44-49GWd/tHM.³² Mean weather and wind conditions for March to May were assumed. Current available nuclear specialist estimates for radioactivity spread from Zaporizhzhia under such conditions were assumed, including the mean spread estimate spanning Ukraine, southeastern Russia, Belarus, Turkey, and Europe (north to Sweden, northwest to the United Kingdom, west to France) (33). Blast and radiation-related mortality was set as the primary epidemiological outcome, encompassing immediate blast trauma, Acute Radiation Syndrome (ARS), and radiation-induced and accelerated cardiovascular disease and cancer. Economic inputs relate to the mean costs of the below treatments and control. It was assumed that only symptomatic exposed patients (cases) would utilize hospital and outpatient services and that asymptomatic exposed or possibly exposed populations (non-cases) would use post-exposure services at a rate of 86%. Mortality costs were calculated using the human capital formula as the lost current monetary value of future productivity from premature mortality.

There were additionally necessary and standard model assumptions. It was assumed there would be no substantive emergency preparedness at the health system level for nuclear terror (for hospital and outpatient treatment) or transportation level given the unprecedented threat of a continent-wide nuclear fallout, the absence of any substantive plans with accompanying resources anywhere in the world at this scale, and the practical impossibility to rapidly evacuate at scale the European continent and surrounding region. Population totals were obtained from the World Bank for the above affected regions accounted for the refugee migration

up to March 9, 2022 (34). The model assumed there were no effective post-exposure prophylaxis given the absence of any commonly accepted and effective post-radiation prophylaxis for blast trauma or moderate to severe ARS. Based on US Centers for Disease Control and Prevention (CDC) data, treatment was considered to have no mortality benefit for blast trauma victims, minimal ARS cases with bone marrow syndrome (up to 10 Gray [Gy] units), nearly absent for ARS cases with gastrointestinal syndrome (over 10 Gy), and absent for ARS cases with cardiovascular or central nervous system syndrome (over 50 Gy) (35).

For the prevention scenario, the costs were calculated based on the UN peacekeeper force or North Atlantic Treaty Organization (NATO) reclaiming of the Russian-occupied Zaporizhzhia plants, defensive support to protect the plants for the duration of the war, and limited humanitarian no-fly zone (or at least humanitarian air bridge or corridors or S-300 surface-to-air missile defense system) based on prior similar operations (36). These actions were deemed the minimal tactically necessary actions to prevent nuclear meltdown given the following: a) the global consensus about the failure of alternative means including sanctions from deterring Russian threats against the above facilities and the Ukrainian inability thus far to retake these facilities; b) the threat of continued Russian air attacks without a UN or NATO-enforced no-fly zone or S-300 defense system; c) the UN and NATO hesitation thus far of enforcing a military no-fly zone for fear of precipitating a direct Russian, NATO hot conflict (as the humanitarian zone would not directly engage Russian fighters except defensively, and the provision of the S-300 defensive missiles could be used solely by Ukrainian forces including could be solely used to protect humanitarian corridors without operation by NATO actors, while a military no-fly zone would potentially directly engage Russian fighters by NATO actors offensively); d) the growing international pressure promoting the necessity of at least such a focused no-fly zone or air bridge or S-300 system to deter rather than encourage Russian confrontation (in-

cluding the open letter signed by the US's former Supreme Allied Commander of Europe and 26 other former top diplomats, military commanders, and White House advisors); e) the Russian President, Vladimir Putin, has already deemed US and EU sanctions against Russia amounting to «economic war»; f) the US CIA Director already confirmed the US intelligence community's conviction that Putin will use any means necessary to «win» his war against Ukraine; g) and the prior success of the 1948-1949 Western-led Berlin Airlift breaking the Soviet blockage against food and water for western Berlin civilians (while avoiding direct military and nuclear conflict between the Americans and Soviets) (37, 38, 39, 40). For the treatment and control scenarios, costs were adjusted by the expected permanent uninhabitable zone around the blast site requiring complete population relocation. Maximum and minimum values were determined based on varying degree of interventions' effectiveness, blast and radioactivity spread radius, and 3% and 5% discount rate for present value of expected future earnings from the CDC (41, 42).

2.2. Cost effectiveness analysis

We performed this cost analysis utilizing the methodology adopted by the CDC (43), commonly accepted figures as inputs, and both low and high extreme assumptions to generate the mean expected success of Intervention A (prevention) and Intervention B (treatment) compared to Control (no prevention or effective treatment) based on standard bioterrorism modelling and management (noted in the above Introduction). Prevention entailed the above collective actions taken to avoid the above nuclear terror event (produced through, [a] a false flag operation sabotaging a Ukrainian nuclear power plant producing a Chernobyl-like nuclear meltdown; [b] the deliberate continued military occupation of the plant increasing the likelihood of accidental disruption of operations and thus malfunction and meltdown [i.e. through disruption of plant power from power grid or generator failure or damage, or damage inflic-

ted on the cooling tanks sufficient to drain them]; or [c] deliberate indiscriminate military assault near the plant resulting in accidental disruption of operations and thus malfunction and meltdown). Sanctions were not considered as part of prevention given: a) the global consensus of sanctions' historical failure to significantly alter state actions particularly military actions (including the Soviet Union and Putin's 2014 seizing of Ukraine's Crimea region); b) the growing concern sanctions will fail to force Putin to cease Russia's current war with Ukraine; c) no discernible deterrent effect of Russia's escalating military actions (evidenced by Russia's assault on the Zaporizhzhia plant, its continued occupation of Ukrainian power plants including Zaporizhzhia, and its growing alleged war crimes and terror acts against civilians) (44). Treatment was deemed an effective consequence management program per standard bioterrorism management including: hospitalization and post-hospitalization outpatient visits for case patients, postexposure monitoring for non-case populations, emergency evacuation for case and non-case populations, and environmental decontamination. Economic results are expressed in US dollars.

2.3. Machine learning analysis

The above analysis was augmented by machine learning (ML) to confirm adequately robust estimates by amplifying the assumptions 1000-fold for each algorithm, re-running the model using the below algorithms, and collapsing the results into stable mean results to confirm the above traditional statistical analysis (43), supervised learning algorithms were utilized with 10-fold cross validations selected based upon the data type. Performance among algorithms were assessed based on higher accuracy, lower Root Relative Squared Error (RRSE) with model acceptability set at 100% (for comparison among ML algorithms), and lower Root Mean Squared Error (RMSE, for comparison to traditional statistical results). The follo-

wing algorithms by type were tested: *Bayesian* (Bayes Net, Naive Bayes, Naive Bayes Multinomial Text, and Naïve Bayes Updateable); *Functions* (Logistic, Multilayer perceptron, SGD, SGD Text, Simple Logistic, SMO, and Voted Perceptron); *Lazy* (IBK, KStar, and LWL); *Meta* (AdaBoostM1, Attribute Selected Classifier, Bagging, Classification via Regression, CV Parameter Selection, Iterative Classifier Optimizer, Logit Boost, Multiclass Classifier, Multiclass Classifier Updateable, Multi-Scheme, Random Committee, Randomizable Filtered Classifier, Random Sub-Space, Stacking, Vote, and Weighted Instances Handler Wrapper); *Miscellaneous* (Input Mapped Classifier); *Rules* (Decision Table, JRip, OneR, Part, and ZeroR), and *Trees* (Decision Stump, Hoeffding Tree, J48, LMT, Random Forest, Random Tree, and REP Tree).

2.4. Health equity analysis

Equitable health outcomes were assessed based on publicly available official estimates pertaining to socioeconomic and racial groups as defined in the current nuclear, bioterrorism, medical, and public health literature to determine possible divergences in outcome not adequately explained by biology and pathophysiology but potentially by modifiable sociocultural traits. The model assumed the disproportionate health and economic impact of the nuclear meltdown would be born by lower income particularly racial minority communities who are particularly dependent upon such vulnerable economic sectors as tourism, agriculture, and fishing industries which would be particularly hard hit (45, 46). The model assumed the closest multinational disaster with the most reliable data that may approximate such a multinational nuclear meltdown may be the COVID-19 pandemic, in terms of the scope, severity, and duration of sustained disruption in health, economic, and societal operations. Health inequity costs for the above meltdown were thus calculated by the World Bank estimates of COVID-19

related poverty increases and the cost of poverty to the larger economy, relative to Europe (47).

2.5. *Computational ethical analysis*

Ethical analysis with AICE was then conducted. Its first two phases respectively included the cost effectiveness and health equity analyses above to inform the third phase of concrete ethical analysis to produce proposed conclusions on concrete responses to the situation in question. AICE was thus conducted by integrating the above quantitative analysis with the global bioethical framework of the Personalist Social Contract (PSC) (48, 49, 50, 51). The PSC is a novel integration of modern ethics (principally utilitarianism-informed Rawlsian social contract of political liberalism, bounded by Kantian deontology and informed by feminist, Marxist, deconstructionist, and ecological ethics) and classical ethics (principally Thomistic-Aristotelian virtue ethics, articulated by William Carlo's *esse-/essence* revision of Norris Clarke's Strong Thomistic Personalism, a derivative formulation of Thomism which itself a development of Aristotelianism) (52, 53, 54, 55, 56, 57, 58).

The core structural features of its framework are as follows. Metaphysically, it incorporates a Carlo-refined Clark-style Strong Thomistic Personalism that recognizes the person in her/his objective and subjective dimensions as being she/he who is most complete, happy, and flourishing in a gift of self specifically to other persons in love, and to other beings more generally in responsible care for the larger non-person ecosystem. As such, it entails an extended defense of a metaphysics of multiculturalism that explicitly cites the world's diverse belief systems (including in their canonical texts as applicable) and elaborates the substantive converging (not simply Rawlsian-like overlapping) consensus as metaphysical (not simply political) of the identify of the person individually, and thus the criteria for justice and its subsequent peace communally. This consensus is a three-dimensional conception of human digni-

ty that is intellectually derivative from the metaphysical identity of the human person grounded in the good. In origin, order, and orientation, the person can be understood (commonly across belief systems and through sufficiently respectful and careful exploration of those belief systems) to have intrinsic and non-finite (or arbitrarily limited) value. She/he comes into existence according to the particular essence of the human person (but not by the power of the individual person) and as such increasingly realizes her/his full dignity through increasingly knowing and willing the ultimate good and its accordingly ordered instrumental goods as its appropriate means (which includes the common good of the human community which constitutes concurrently the unique individual good of each person realized in a gift of self to the community, while the community serves the instrumental goods or needs of the person, including the highest which is to fully know and be united with the ultimate good). This existential origin and related moral order are ultimately orientated to the *teleological* ultimate good or end which is Goodness Itself (as Aristotle described, but refined according to the Thomistic Clark account of *Esse* or the Sheer Act of Existence or Being Itself [which is Love Itself], further refined by the Thomistic Carlo's clarification of thick-*esse*/*thin-essence* and metaphysical receptivity as transcendental perfection or completion). Rationally derivative from this metaphysical foundation is the PSC's theoretical principles (definition of and thus respect for individual dignity and communal culture [the latter being the collective and relational search for the ultimate good as the most fundamental, human, and personal of all endeavors and acts]), its practical principles of solidarity and subsidiarity, and its primary ethical principle of the Wojtylan Personalist Norm (as a modification of Kant's second categorical imperative elevating the Enlightenment's and constructivist minimalist ethical principle to the personal dimension by arguing for love as the essence of a full conception of ethics based on justice or what is due to persons from other per-

sons, since the «person is a good towards which the only proper and adequate attitude is love»). These principles are relationally ordered in the pluralistic framework emerging from the above Thomistic Personalist metaphysical foundation by incorporating the unique perspectives in their own words of the world's diverse belief systems (including Buddhism, Christianity, Confucianism, Daoism, Hinduism, Islam, Judaism, and secularism [with particular attention paid to the nuances and subtleties among and between these religious frameworks including atheism and agnosticism]) (59, 60, 61, 62, 63, 64, 65, 66).

The PSC was chosen as the primary ethical framework for its: a) practical, b) political, and c) philosophical advantages over competing frameworks: a) practically, it is historically articulated in the world's most dominant and cited ethical system (of human dignity-based rights and duties) as expressed paradigmatically by the UN's 1948 United Nations Declaration of Human Rights and resultant international law and related international ethical conventions; b) politically, it is the only ethical framework that substantively accounts for and facilitates the convergence of the world's nations (including through the UN explicitly grounded in the UDHR) and belief systems (including the above); and c) philosophically, it uniquely corrects the foundational metaphysical errors and resultant logical self-contradictions of modern ethics through the classic Aristotelian-derived Thomism and its Thomistic Personalist formulation, but made intelligible in modern terms, while producing the conclusions that modern ethics otherwise largely attempts but fails logically to reach and defend (including the protection of pluralism and multiculturalism which modern ethics largely ultimately truncates or excludes). The extended, detailed, and comprehensive definition and defense of these reported advantages are outside the scope of this focused manuscript; thus, the above references are cited for additional reading as relevant for particular readers (especially Monlezun 2020 and Monlezun 2022 as full-length books

providing synthetic summary and elaboration of the above and related works as part of a larger definition and defense of PSC). Additionally, further definition and defense for the PSC was considered superfluous for this manuscript and irrelevant for the vast majority of readers given the largely uncontroversial and generally accepted conclusion reached at the end of the results that an optimal multi-national response across diverse belief systems is required for this crisis on both economic and ethical grounds (but even the economic grounds are considered by this paper to be sufficient reasoning to support collective action). And so the particular ethical framework diverse readers invoke explicitly or implicitly to reach this conclusion is irrelevant to the paper. Its primary ethical framework is at least compatible with readers' diverse ethical frameworks (a generally accepted claim) and at most is more compellingly argued using the paper's PSC framework (a less generally accepted claim that still does not need to be proven in the brief confines of this paper for the end of the conclusion to still hold, regardless of the particular means that diverse readers may take to arrive at it).

3. Results

3.1. Cost effectiveness analysis

Epidemiologically, there would be 0 exposed in the prevention scenario and 943 million exposed from radioactivity spread in the treatment and control scenarios. For mortality, there would 39 deaths in the prevention scenario, 1,886 deaths in the treatment scenario, and 4,715 deaths in the control scenario. Economically, the prevention costs would be \$37.2 million, treatment costs would be \$306.2 trillion, and the control costs would be \$66.0 trillion.

Cost analysis indicated that there is a cost-effectiveness ratio for prevention versus treatment of \$165.8 billion saved per averted

death and net savings of \$306.2 trillion. The cost-effectiveness ratio for prevention versus control of \$14.1 billion saved per averted death and net savings of \$60.0 trillion. Machine learning analysis confirmed comparable above results by RMSE (Root Mean Squared Error).

3.2. Health equity analysis

Lower income communities particularly poorer racial minorities would bear the disproportionate health and economic burden of nuclear meltdown in both the treatment and control scenarios from diverse factors, particularly decreased capacity for individuals (for evacuation, healthcare system access for treatment of post-exposure complications and resumption of pre-existing comorbidity and non-radiation acute management, and security [food, housing, education, jobs, and non-discrimination], violence exposure [including gender-based]) and states (for building health system surge capacities for post-exposure treatment, resuming non-radiation operations, making up for lost economic output, opportunity costs for talent migration to richer and less impacted states, and related public health capacities [including welfare, education, infrastructure, and defense]). Such inequities would total \$493.7 trillion over 25 years.

3.3. Personalist Social Contract computational ethical analysis

The above health and economic inputs then informed the final phase of the computational ethical analysis. The primary material objects of this ethical analysis were false flag weaponization of a Ukrainian active nuclear power plan or deliberate assault and occupation of one with subsequent accidental compromise of its operations (with either situation resulting in plant blast, nuclear meltdown, and transcontinental radioactivity spread). The secondary material

objects were prevention (military re-conquest of such facility and narrowly focused humanitarian no-fly zones or humanitarian air bridge to prevent recurrent loss of the facility or capture of any related), treatment (evacuation, emergency response, hospital care, and outpatient follow-up), and control (none of the above). The primary formal object or analytic framework is the PSC.

In brief, the PSC argues that the world's diverse belief systems (including Buddhism, Christianity, Confucianism, Hinduism, Islam, Judaism, and secularism) converge substantively, metaphysically, and ethically in the shared conviction of the intrinsic and inviolable dignity of every human person. This dignity is derivative from her/his biological identity as a human being (regardless of any artificially or arbitrarily identified traits such as sex, nationality, or belief system). As such, the person is a dependent rational animal from conception to death, linked in societal inter-dependencies requiring and fostering virtuous and thus just treatment to all members of the human community to survive and thrive. The community in turn is required for the full flourishing of the human person who finds her/his fulfillment (union with good itself) in the duty of justice contributing to the common good of the community, which in turn safeguards the individual good of the person (completed metaphysically in the highest form of justice which is love, the commitment of the will to the objective good of the other person as other, as love is ultimately what is due to a person insofar as she/he is a person). The PSC defines and defends such convergence, which is individually echoed and anchored in the above diverse belief systems' principles (with Buddhism's *sila*, Christianity's doctrine of Jesus' incarnation and redemptive passion and resurrection, Confucianism's *jen* and *yi*, Hinduism's *dharmā*, Islam and Judaism's [along with Christianity's] doctrine of humanity made in the image and likeness of God and destined for unity with God through a just life of love, and secularism's Rawlsian-like political and pluralistic 'justice' as fairness).

Applied to this concrete ethical situation, the formal PSC argument is as follows:

Premise 1. The Russian invasion of Ukraine is an unprovoked attack against another sovereign nation in such a manner that indiscriminately deprives soldiers and civilians of life, liberty, and property.

Premise 2. Life, liberty, and property are individual and state rights derivative from the human person's dignity.

Premise 3. Respect for dignity at the individual level requires respecting the person's rights to goods necessary for the person to virtuously develop through just and stable commitment to the common good in unique love of others and thus the community.

Premise 4. Respect for dignity at the communal level requires respecting another culture as the communal manifestation of its constitutive individuals seeking through justice the common good as the objective good of the community entailing the objective good of individual flourishing (subjectively experienced as the ultimate individual good of self-actualization through justice completed in love uniting the person to the community united in goodness itself).

Premise 5. The Russian invasion fails to respect the rights of multinational individuals in Ukraine (including Ukrainians, Europeans, Middle Easterners, Africans, Asians, and Americans) and the state of Ukraine.

Premise 6. The above political and strategic factors noted in the Methods and above Results sections detail the growing consensus about the increasing risk of Putin accelerating his attempted Ukrainian conquest through false flag bioterrorism of nuclear terror or continued indiscriminate civilian and civilian infrastructure assaults and occupation (including of nuclear plants which plausibly increase the known risk of nuclear meltdown).

Premise 7. The above prevention actions currently appear to be the only viable remaining actions necessary and sufficient to eliminate the above risk.

Premise 8. The factors listed in Premise 6 additionally are reasonably expected to strategically accelerate the sufficiently Western-supplied Ukrainian defenses to repel Russian invasion forces and thus accelerate the war's cease-fire negotiation and conclusion.

Premise 9. The unprecedented health, economic, societal, and ecological costs for treatment and non-prevention exceed multiple times over what even the global population and economy could afford (including Russia), amid mounting global costs already in energy and finance and food limitations disproportionately impacting lower income nations.

Conclusion. Therefore, UN or NATO defensive reclaiming of the Ukrainian power plants and a limited humanitarian no-fly zones, humanitarian air bridge or protected humanitarian corridors, or S-300 system are required to eliminate the unjust nuclear terror risk, including by accelerating the prompt end of the war (without which the nuclear terror risk remains excessively elevated).

4. Discussion

Our study provides novel evidence that decisive multinational defensive action in Ukraine may be required to prevent deliberate or accidental nuclear terror events as bioterrorism causing historic health and economic costs many times greater than even the global economy. These results are derived from the first comprehensive computational ethical, equity, and economic analysis of nuclear terrorism as bioterrorism, the Russian-Ukraine War (to inform interventions optimizing health system and public health resiliency and responsiveness to patient and population needs), and the first to use an AI-driven integrated and complementary methodology uniting medicine, public health, ethics, and economics. This analysis quantitatively demonstrates the general consensus that there is no plausible health system or public health response to a multina-

tional transcontinental nuclear meltdown and radioactivity spread event. Not only would this exceed even the dimly imagined capacities of system and states' current capacities, but the \$306.2 trillion treatment costs post-meltdown would be over 3 times the global economy's GDP. Nor is there any plausible way to evacuate Europe in the event of a meltdown. The \$493.7 costs of health inequities of such an event would eclipse even the above estimates, setting back health system and public health capacities, as well as humanity's development, by at least decades (with the disproportionate burden of such challenges being shouldered by lower income particularly racial minority communities). It should be noted here that every patient population is constituted by individual patients with names who are each unique persons, none of whom can be solely reduced to a dollar amount. This analysis thus sought to economically consider competing health-related policies (according to the standard and required viewpoint for any policy decision affecting populations), without losing sight of the concurrent ethical consideration of the intrinsic and equal value of each person within those populations.

Ethically, decisive defensive actions may thus be required to prevent such catastrophic scenarios to protect the human dignity, rights, and justice not only for Ukrainians, but also Russians (who would also significantly suffer historically in such scenarios) along with the international community. Our global community is already present in this increasingly urgent situation, as civilians of diverse nations are being killed and trapped by the growing Russian military onslaught and the economic fallout extends to us all. The March 9th Russian direct hit missile strike on a Ukrainian maternal and children's hospital prompted the WHO Director-General to urgently address what is described as the worsening Ukrainian health and humanitarian crisis (with the Ukrainian health system struggling to continue needed life-saving treatment [and ongoing COVID-19 surveillance and response] under military siege and assault, and the

over 2 million refugees are struggling to find sufficient care for hypothermia, frostbite, respiratory diseases, mental health, cancer, and cardiovascular disease); thus, he concluded that «the only real solution to this situation is peace» (67). Following the WHO and UN, these unfolding medical and public health catastrophes suggest that the global health community may have to consider peace (and its prerequisite human security) as the necessary component (and foundation) of modern medical treatment and public health prevention. Peace therefore may be the only adequate healthcare response to such a crisis. This suggests in a concrete and urgent sense, such societal dimensions of our healthcare systems are not ancillary but necessary concerns for us. It seems as healthcare workers we may need to become peacemakers and advocates if health is to continue.

And there appears to be a closing window for the healthcare and international community to respond to this crisis which is already affecting the world over. Consensus in NATO spanning 28 European and 2 American nations indicates that Russia increasingly is resorting to such terror tactics in the face of their invasion, largely stalled by significantly stronger and more united than expected Ukrainian defense and Western aid (68). Weaponized disinformation campaigns are concurrently accelerating by state-controlled Russia media outlets alleging without evidence that Ukraine is threatening Russia by making a nuclear dirty bomb (69). This follows repeated failed Russian false flag operations prior to the invasion in which Russia attempted to portray Ukraine as an aggressive force threatening Russians (in which Russia stages incidents such as car bombing and then blames them on Ukraine to «justify» military response) (70). Putin increased the stakes further by recently threatening nuclear response by placing put his nuclear forces on «high alert», a move denounced universally as a «reckless» and unnecessary escalation of a conflict he began (71). The US intelligence community reported its analysis conclusions to a congressional hearing on March 8, 2022, that for Putin, Ukraine is a «war he can-

not afford to lose» through any means deemed necessary (including nuclear weaponized means as long as it denies victory to Ukraine) (72). A March 9th open letter by the former commander of the US Special Operations Command in Europe, Major General Mike Repass (who on US government contract advised the Ukrainian military for 6 years), and other senior retired US and European military leaders urgently advocate for more S-300 missile defense systems to be supplied to Ukraine (thus avoiding the risk of a NATO-enforced no-fly zone triggering a larger NATO-Russia war, while still providing effective defense against mid-to-high altitude offensive jet and ballistic missiles) (73). The mounting security stakes were reflected by the US Central Intelligence Agency (CIA) Director, Bill Burns, on April 14th who emphasized how the CIA is «very intently» monitoring to ensure Putin does not ready tactical nuclear weapons for attacks in Ukraine given the mounting concern about his «potential desperation... [and military] setbacks» as his «risk appetite has grown» (74). Such defensive options to reduce such significant risks indicate that the world's nations have a wide range of means to accelerate conflict de-escalation (by providing effective defensive support to Ukraine to significantly reduce not only the current catastrophe there, but also the likelihood of wider nuclear meltdown as a collateral damage from this ongoing conflict). This study further suggests through health, economic, and ethical analyses that responding to a nuclear meltdown as a continental level-threat is not feasible, leaving the strategic means to avoid such outcomes to the political and military communities to urgently implement.

The following study limitations require consideration in light of the results. The accuracy and precision of model predictions may be reduced based on the accuracy and precision of the model's assumptions and data inputs. Therefore, the cost model was constructed using a commonly accepted standard methodology (which was clearly detailed and included as minimal and reasonable assumptions, along with current data shared among various authoritative

sources). The ethical analysis featured as minimal assumptions as possible, detailing of its methodological and socio-cultural influences, and clear argumentative steps to improve transparency and validity according to generally accepted philosophical standards.

5. Conclusion

Ethical and economic analyses indicate decisive defensive interventions may be required to prevent catastrophic bioterrorist nuclear terror events (either false flag operations weaponizing or accidental damage compromising Ukrainian nuclear power plants, amid mounting global concern of the deliberate use of tactical nuclear weapons), along with the compromised health and security of hundreds of millions of peoples from diverse nations, belief systems, and health systems. These conclusions are derived from the first comprehensive AI-guided computational ethical, health equity, and cost effectiveness study on this topic. Following the WHO and *Lancet* Editor-in-Chief, the medical and public health communities may need to increasingly consider human security and sustainable peace as necessary foundations for the efficient, effective, and equitable optimization of our research and its translation into our world's most urgent health challenges, particularly the health and humanitarian crisis in Ukraine.

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Data availability

The data used to support the findings of this study are publicly available from the cited sources.

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Bibliographic references

1. Feehan J, Apostolopoulos V. Is COVID-19 the worst pandemic? *Maturitas*. July, 2021; 149: 56-58. <https://doi.org/10.1016/j.maturitas.2021.02.001>
2. Horton R. Ukraine and the lessons of Alexander Herzen. *The Lancet*, 2022; 399: 895.
3. Ogata S, Sen A. *Human security now: protecting and empowering people*. United Nations Commission on Human Security. New York, NY: UN Press, 2003.
4. Naciones Unidas. *Universal Declaration of Human Rights*. New York, NY: UN Press, 1948.
5. Braithwaite S, Schmidt N. «Fastest growing refugee crisis in Europe since World War II»: More than 1.5 million people have crossed from Ukraine into neighboring countries. *CNN*, March 6, 2022. (Accessed on March 6, 2022). Available at: <https://tinyurl.com/3rkjupn9>
6. Cole D. Blinken says US has seen reports of Russian abuses in Ukraine that «would constitute a war crime». *CNN*, March 3, 2022. (Accessed on March 6, 2022). Available at: <https://tinyurl.com/57ewkymr>
7. Durbin A. Ukraine: Putin has already carried out war crimes, Boris Johnson. *BBC*, March 6, 2022. (Accessed on March 6, 2022). Available at: <https://www.bbc.com/news/uk-60588031>
8. Lillis KB, Starr B, Sciutto J, Herb J. US officials warn Russia will increasingly hit civilian targets and seek «slow annihilation» of Ukraine's military. *CNN*, March 2, 2022. (Accessed on March 2, 2022). Available at: <https://www.cnn.com/2022/03/02/politics/us-russia-ukraine-civilians-warning/index.html>
9. Harris R, Galloway A. Mariupol besieged as Russians prepare to «bombard cities into submission». *The Sydney Morning Herald*, March 6, 2022. (Accessed on March 6, 2022). Available at: <https://tinyurl.com/3tyfekzc>
10. Fossum S, Liptak. Biden on Putin: «I think he is a war criminal». *CNN*, March 17, 2022. (Accessed on March 17, 2022). Available at: <https://www.cnn.com/2022/03/16/politics/biden-calls-putin-a-war-criminal/index.html>
11. Bubola E. Reports of civilian casualties rise in Ukraine, but exact counts remain uncertain. *New York Times*, March 2, 2022. (Accessed on March 4, 2022). <https://www.nytimes.com/2022/03/02/world/europe/ukraine-civilian-casualties.html>
12. Lister T, Pennington J, McGee L, Gigova R. «A family died... in front of my eyes»: Civilians killed as Russian military strike hits evacuation route in Kyiv suburb. *CNN*, March 7, 2022. (Accessed on March 7, 2022). Available at: <https://tinyurl.com/2p867w7c>
13. Ukraine: UN chief calls for safe passage from conflict zones, rights body records 1,123 civilian casualties, WHO outlines health concerns. *United Nations News*, March 6, 2022. (Accessed on March 6, 2022). Available at: <https://tinyurl.com/y38xww3d>

14. Farge E. WHO says at least nine killed in 16 attacks on Ukraine health care. *Reuters*, March 7, 2022. (Accessed on March 7, 2022). Available at: <https://tinyurl.com/43c8ffu7> <https://doi.org/10.1136/bmj.o570>
15. Khan K. Statement of ICC Prosecutor, Karim AA. Khan QC, on the situation in Ukraine: Receipt of referrals from 39 States Parties and the opening of an investigation. *International Criminal Court*, March 2, 2022. (Accessed on March 4, 2022). Available at: <https://tinyurl.com/bdhwzmzt>
16. General Assembly resolution demands end to Russian offensive in Ukraine. *United Nations News*, March 2, 2022. (Accessed on March 4, 2022). Available at: <https://news.un.org/en/story/2022/03/1113152>
17. Yeung J. *et al.* Russia invades Ukraine. *CNN*, March 4, 2022. (Accessed on March 4, 2022). Available at: <https://tinyurl.com/3rkjupn9>
18. Lister T, Voitovych O, McCarthy S, Kolirin L. Ukrainian nuclear power plant attack condemned as Russian troops «occupy» facility. *CNN*, March 4, 2022. (Accessed on March 4, 2022). Available at: <https://tinyurl.com/3rkjupn9>
19. Blake A. Biden administration cautiously approaches accusing Russia of war crimes. *Washington Post*, March 7, 2022. (Accessed on March 7, 2022). Available at: <https://tinyurl.com/2p86t46s>
20. Gill V. Ukraine nuclear plant: Russia in control after shelling. *Foreign Policy*, March 4, 2022. (Accessed on March 4, 2022). Available at: <https://www.bbc.com/news/world-europe-60613438>
21. Ghosh P. Ukraine war: Chernobyl power supply cut off, says energy operator. *BBC*, March 9, 2022. (Accessed on March 9, 2022). Available at: <https://www.bbc.com/news/world-europe-60678598>
22. St John R, Finlay B, Blair C. Bioterrorism in Canada: An economic assessment of prevention and postattack response. *Can J Infect Dis*. September 2001; 12(5): 275-284. <https://doi.org/10.1155/2001/904148>
23. Kyriacou DN, Dobrez D, Parada JP, Steinberg JM, Kahn A, Bennett CL, Schmitt BP. Cost-effectiveness comparison of response strategies to a large-scale anthrax attack on the Chicago metropolitan area: Impact of timing and surge capacity. *Biosecur Bioterror*. September 2012; 10(3): 264-279. <https://doi.org/10.1089/bsp.2011.0105>
24. Fowler RA, Sanders GD, Bravata DM, Nouri B, Gastwirth JM, Peterson D, Broker AG, Garber AM, Owens DK. Cost-effectiveness of defending against bioterrorism: A comparison of vaccination and antibiotic prophylaxis against anthrax. *Ann Intern Med*. April 19, 2005; 142(8): 601-610. <https://doi.org/10.7326/0003-4819-142-8-200504190-00008>
25. Monlezun DJ, Sotomayor C, Peters NJ, Gallagher C, García A, Iliescu C. COVID-19 population lockdowns may worsen socioeconomic inequities disproportionately impacting racial minorities: Machine learning-augmented cost effectiveness and computational ethical analysis with personalist social contract. *Revista de Medicina y Ética*. July 2021; 32(3): 759-800. <https://doi.org/10.36105/mye.2021v32n3.04>

26. Monlezun DJ, Hostetter L, Thannoun T, Pabba K, Patel R, Zheng D, Chen N, Iliescu C. TAVR and cancer: Machine learning propensity score mortality and cost analysis in 30 million patients. *CardioOncology*. June 2021; 7(1): 25.
<https://doi.org/10.21203/rs.3.rs-100570/v1>
27. The Chernobyl Accident. International Atomic Energy Agency. 1992. Available at: <https://www.iaea.org/publications/10962/the-fukushima-daiichi-accident>
28. Samet JM, Seo J. The financial costs of the Chernobyl nuclear power plant disaster. *University of Southern California Institute on Inequalities in Global Health*. 2016. Available at: <https://tinyurl.com/2p8t6usa>
29. The Fukushima Daiichi Accident. *International Atomic Energy Agency*. 2015. Available at: <https://www.iaea.org/publications/10962/the-fukushima-daiichi-accident> https://doi.org/10.1007/978-4-431-55160-7_3
30. Hornyak T. Clearing the Radioactive Rubble Heap That Was Fukushima Daiichi, 7 Years On. *Scientific American*, March 9, 2018. (Accessed on March 1, 2020). Available at: <https://tinyurl.com/bdcrx693>
https://doi.org/10.1007/978-3-319-12090-4_15
31. National Research Council. *Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants*. Washington, DC: The National Academies Press; 2014. <https://doi.org/10.17226/18294>
32. International Conference on the Storage of Spent Fuel from Power Reactors. International Atomic Energy Agency. 2003; 91.
33. Putte JV, Burnie S. The vulnerability of nuclear plants during military conflict. *GP International*. 2022. Available at: <https://tinyurl.com/34zv8b6j>
34. Population total. *World Bank*, 2022. Available at: <https://data.worldbank.org/indicator/SP.POP.TOTL?locations=EU>
35. United States Centers for Disease Control and Prevention. Acute Radiation Syndrome. 2022. (Accessed on March 1, 2022). Available at: <https://tinyurl.com/44wkdyv>
36. United States Undersecretary of defense. Defend Budget Materials. *Department of Defense*, 2022. Available at: <https://comptroller.defense.gov/Budget-Materials>
37. Bade R, Lizza R, Daniels E. «Limited» no-fly zone gains steam among foreign policy elite. *Político*. March 8, 2022. (Accessed on March 8, 2022). Available at: <https://tinyurl.com/2uxrsddd>
38. Kremlin says United States unleashed economic war on Russia. *Reuters*, March 9, 2022. (Accessed on March 9, 2022). Available at: <https://tinyurl.com/mrybup6t> <https://doi.org/10.33140/jhss.05.01.08>
39. Barr L. Putin «angry and frustrated», CIA director says, likely to «double down» in Ukraine. *ABC News*, March 8, 2022. (Accessed on March 8, 2022). Available at: <https://tinyurl.com/4f22w3wx>
40. Berlin blockade. *Encyclopedia Britannica*, 2021. (Accessed on March 17, 2022). Available at: <https://www.britannica.com/event/Berlin-blockade>

41. Haddix AC, Teutsch SM, Shaffer PA, Dunet DO, eds. *Prevention effectiveness: A guide to decision analysis and economic evaluation*. New York: Oxford University Press, 1996.
42. Moore R, Mao Y, Zhang J, Clarke K. *Economic Burden of Illness in Canada, 1993*. Ottawa: Ministry of Public Works and Government Services Canada, 1997.
43. Russell LB, Sinha A. Strengthening cost-effectiveness analysis for public health policy. *American Journal of Preventive Medicine*. 2016; 50(5): S6-S12. <https://doi.org/10.1016/j.amepre.2015.11.007>
44. Afesorgbor SK, Bergeijk PAG. Economic sanctions will hurt Russians long before they stop Putin's war in Ukraine. *The Conversation*, March 1, 2022. (Accessed on March 1, 2022). Available at: <https://tinyurl.com/4x2jxz3j>
45. Selling Japan's Food and Tourism after Fukushima. *Japan Times*, March 9, 2012. (Accessed on March 1, 2022). Available at: <https://tinyurl.com/48x5yx2t>
46. Slodkowski A. Rising radioactive spills leave Fukushima fishermen floundering. *Reuters*, June 3, 2013. (Accessed on March 2, 2022). Available at: <https://tinyurl.com/5t2nzjrz>
47. Mahler DG, et al. Updated estimates of the impact of COVID-19 on global poverty: Turning the corner on the pandemic in 2021? *World Bank*, June 24, 2021. (Accessed on March 5, 2022). Available at: <https://tinyurl.com/3zfv9zba> <https://doi.org/10.1016/j.worlddev.2021.105561>
48. Monlezun DJ. *The global bioethics of artificial intelligence and human rights*. Cambridge, UK: Cambridge Scholars Press, 2020.
49. Monlezun DJ. *The global bioethics of artificial intelligence and human rights*. Cambridge, UK: Cambridge Scholars Press, 2022.
50. García A, Monlezun DJ. *Ethical challenges in COVID-19 biomedical research, vaccination, and therapy*. In García A. (Ed), *Bioethics during COVID-19*. Cambridge, Reino Unido: Cambridge Scholars Press. 2022; 5-24.
51. Monlezun DJ, Sotomayor C, Peters N, Steigner L, Gallagher C, García A. The global AI ethics of COVID-19 recovery: Narrative review and personalist social contract ethical analysis of AI-driven optimization of public health and social equities *Medicina y Ética*. 2022; 33: 357-376. <https://doi.org/10.36105/mye.2022v33n2>
52. Schaeffer, M. *Thomistic Personalism: Clarifying and advancing the project*. Toronto, Canada: York University Press, 2016.
53. Carlo W. *The ultimate reducibility of essence to existence in existential metaphysics*. Leiden, Bélgica: Martinus Nijhoff Publishers, 1966.
54. Clarke NW. «Action as the self-revelation of being: A central theme in the thought of St. Thomas». *Explorations in metaphysics: Being, God, person*. Notre Dame. In: University of Notre Dame Press, 1994, cap. 3. <https://doi.org/10.2307/j.ctvpj74zd.6>
55. Aristotle. «Metaphysics». *The Basic Works of Aristotle*. Translated by WD. Ross. Edited by Richard McKeon. New York, NY: The Modern Library, 2001(~323 aC), bk. XII, cap. 9.

56. Clarke NW. *Person and Being*. Milwaukee, WI: Marquette University Press, 1993, p. 4-5.
57. Clarke NW. «*The Integration of Personalism and Thomistic Metaphysics in Twenty-First-Century Thomism*». *The Creative Retrieval of Saint Thomas Aquinas*. New York, NY: Fordham University Press, 2009, p. 226-227.
<https://doi.org/10.5422/fso/9780823229284.003.0016>
58. Aquinas T. *The Summa Theologica*. Translated by The Fathers of The English Dominican Province. Cincinnati, OH: Benziger Brothers, 1947(1274), I.5.1, I.29.3, Ia-IIae.61.2; III.58.3, I.44.4.
59. Saisuta Phramaha. «The Buddhist Core Values and Perspectives for Protection Challenges». United Nations High Commissioner's Dialogue on Protection Challenges Theme. *Faith and Protection*. November 20, 2012. Available at: <https://tinyurl.com/s7hhu8hf> https://doi.org/10.1163/9789004480087_005
60. John Paul II. *Evangelium Vitae*. Vatican City: Vatican Press, 1995.
61. Tsai DF-C. «The Bioethical Principles and Confucius' Moral Philosophy». *British Medical Journal of Medical Ethics*, 2005; 31; 159-163.
<https://doi.org/10.1136/jme.2002.002113>
62. Hansen Chad. «Daoism». *The Stanford Encyclopedia of Philosophy, Spring 2020 ed.* Edited by Edward N. Zalta. Available at: <https://plato.stanford.edu/archives/spr2020/entries/daoism>
63. Nadkarni MV. «*Ethics in Hinduism*». *Ethics for our times: Essays in Gandhian Perspective*. Oxford: Oxford University Press, 2013.
<https://doi.org/10.1093/acprof:oso/9780198073864.003.0010>
64. Hayatli M. «Islam, International Law and the Protection of Refugees and IDPs». *University of Oxford*. January 2009. Available at: <https://www.refworld.org/pdfid/4c68eec82.pdf>
65. Rothenberg, Naftalí. *Rabbi Akiva's Philosophy of Love*. New York, NY: Palgrave-Macmillan, 2017.
66. Rawls John. *Political Liberalism, Expanded ed.* New York, NY: Columbia University Press, 2005.
67. Langmaid V. WHO has verified 18 attacks on health facilities in Ukraine, director general says. *CNN*, March 9, 2022. (Accessed on March 9, 2022). Available at: <https://tinyurl.com/yt4946an>
68. González O. NATO Chief: Russian forces may be targeting evacuating civilians in Ukraine. *Axios*, March 8, 2022. (Accessed on March 8, 2022). Available at: <https://tinyurl.com/4nyj483b>
69. Russia, without evidence, says Ukraine making nuclear «dirty bomb». *Reuters*, March 6, 2022. (Accessed on March 6, 2022). Available at: <https://tinyurl.com/466wxkzx>
70. Devlin K, Horton J, Robinson O. Ukraine crisis: Is Russia staging «false flag» incidents? *BBC*, February 23, 2022. (Accessed on March 4, 2022). Available at: <https://www.bbc.com/news/60470089>

71. «Reckless, dangerous» for Putin to put nuclear forces on high alert: NATO secretary general. *MSNBC*, February 28, 2022. (Accessed on March 4, 2022). Available at: <https://tinyurl.com/d3n25s4d>

72. Hierba J, Lillis KB. JUS intel chiefs to Congress: Putin may escalate conflict in Ukraine with no concern for civilian casualties. *CNN*, March 8, 2022. (Accessed on March 8, 2022). Available at: <https://www.cnn.com/europe/live-news/ukraine-russia-putin-news-03-08-22>

73. Bergen P. Retired Army major general: The Russian military invasion has peaked. *CNN*, April 2, 2022. (Accessed on April 2, 2022). Available at: <https://tinyurl.com/2f736bas>

74. Lillis KB. CIA director warns Russian threat of tactical nuclear weapons should not be taken «lightly». *CNN*, April 14, 2022. (Accessed on April 14, 2022). Available at: <https://www.cnn.com/europe/live-news/ukraine-russia-putin-news-04-14-22>

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