REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. REPORT DATE *(DD-MM-YYYY)* 3-18-2022	**2. REPORT TYPE** Technical Report	**3. DATES COVERED *(From - To)***
4. TITLE AND SUBTITLE COVID-19: A Selected Bibliography.		**5a. CONTRACT NUMBER** **5b. GRANT NUMBER** **5c. PROGRAM ELEMENT NUMBER**
6. AUTHOR(S) Fairchild, Christina L.		**5d. PROJECT NUMBER** **5e. TASK NUMBER** **5f. WORK UNIT NUMBER**
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Defense Technical Information Center, 8725 John J. Kingman Road, Fort Belvoir, Virginia 22060-6218		**8. PERFORMING ORGANIZATION REPORT** DTIC-TR-2022-02
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Defense Technical Information Center, 8725 John J. Kingman Road, Fort Belvoir, Virginia 22060-6218		**10. SPONSOR/MONITOR'S ACRONYM(S)** **11. SPONSOR/MONITOR'S REPORT NUMBER(S)**

12. DISTRIBUTION / AVAILABILITY STATEMENT

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

SUPPLEMENTARY NOTES

14. ABSTRACT

This is a selected bibliography on the topic of COVID-19. This bibliography includes topics such as COVID-19 case studies, vaccines, studies on SARS-CoV-2, personal protective equipment, drugs to treat COVID-19, and more. This report supersedes AD1125945.

15. SUBJECT TERMS: SARS-CoV-2, Coronavirus, COVID-19, Pandemic, Health Services, Medical Personnel, Antiviral Agents, Disease Outbreaks, Cardiovascular System, Hygiene, Viruses, Military Medicine, Quarantine, Airway Management, Interferon, Patient Care, Microbial Genome, Personal Protective Equipment, Vaccines, Contagion.

16. SECURITY CLASSIFICATION OF: Unclassified			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON: Christina Fairchild**
a. REPORT U	**b. ABSTRACT** U	**c. THIS PAGE** U	SAR	169	**19b. TELEPHONE NUMBER *(include area code)*** 571-448-9799

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

COVID-19: A Selected Bibliography

DTIC-TR-2022-02

Distribution Statement A

Authorized for public release. Distribution is unlimited.

DoD Funded Research related to SARS-CoV-2

Since the beginning of the spread of SARS-CoV-2, which causes COVID-19, the U.S. Government began to research how to stop the spread, treat patients, and develop a vaccine. This bibliography includes Department of Defense-funded reports related to COVID-19. Topics include decontamination, personal protective equipment, vaccines, pandemic response, treating patients, testing, and convalescent plasma, among others.

These reports are available on https://discover.dtic.mil. You can find reports related to coronaviruses here.

Contents

Aerosol Viruses **13**

Airborne Transmission Risk: Ventilation and Filtration in Occupied Buildings During the SARS-Cov-2 Pandemic 13

Aerosol and surface contamination of SARS-CoV-2 observed in quarantine and isolation care 13

COVID-19 Virus Shedding 14

Asymptomatic Shedding of Respiratory Virus Among an Ambulatory Population Across Seasons 15

An Experimental Investigation of the Performance of a Collison Nebulizer Generating H1N1 Influenza Aerosols 16

Aerosol-phase Activity of Iodine Captured from a Triiodide Resin Filter on Fine Particles Containing an Infectious Virus 16

Evaluation of the Performance of Iodine-Treated Biocidal Filters Under the Influence of Environmental Parameters 17

Inactivation of Aerosolized Biological Agents using Filled Nanocomposite Materials 18

Disinfection of Airborne Organisms by Ultraviolet-C Radiation and Sunlight 19

Improving Protection against Viral Aerosols Through Development of Novel Decontamination Methods and Characterization of Viral Aerosol 19

Biological Aerosol Test Method and Personal Protective Equipment (PPE) Decontamination 20

High Volume Air Sampling for Viral Aerosols: A Comparative Approach 21

Challenge of N95 and P100 Filtering Facepiece Respirators with Particles Containing Viable H1N1 22

Care of Patients **23**

Descriptive Analysis of COVID-19 Aeromedical Evacuations by Critical Care Air Transport Teams 23

Low Cost, High-Throughput 3D Pulmonary Imaging Using Hyperpolarized Propane Gas 23

A Retrospective Review of Emergency Department Visits That May Be Appropriate for Management in Non-Emergency Settings 24

Improved adherence to best practice ventilation management after implementation of Clinical Practice Guideline (CPG) for United States military Critical Care Air Transport Teams (CCATTs) 25

Development and Advancement of Broad-Spectrum Respiratory Antivirals 26

Guidelines for En Route Medical Care in Present and Future MEDEVAC Operations (COVID SMOG Annex) 26

Audit of Infectious Disease Medical Treatment Capabilities at Al Udeid Air Base, Qatar 27

Baricitinib plus Remdesivir for Hospitalized Adults with Covid-19 27

Elevated Nosocomial Infection Rates in Patients with COVID-19 Requiring Extracorporeal Membrane Oxygenation 28

Prone Positioning in Moderate to Severe Acute Respiratory Distress Syndrome Due to COVID-19: A Cohort Study and Analysis of Physiology 29

Evaluation of Department of Defense Medical Treatment Facility Challenges During the Coronavirus Disease-2019 (COVID-19) Pandemic 30

Supplementary Information for MADVent: A Low-Cost Ventilator for Patients with COVID-19....30

Risk Stratification of Hospitalized COVID-19 Patients Through Comparative Studies of Laboratory Results with Influenza....31

USNS COMFORT (T-AH 20) Surgical Services Response to the COVID-19 Pandemic in New York City 32

Initial Emergency Department Mechanical Ventilation Strategies for COVID-19 Hypoxemic Respiratory Failure and ARDs 33

Sentinel Case of COVID-19 at Fort Stewart, GA in a National Guard Soldier Participating in Annual Training: A Case Report 34

Optimizing Peripandemic Care for Veteran Major Non-Traumatic Lower Extremity Amputees: A Proposal Informed by a National Retrospective Descriptive Analysis of COVID-19 Risk Factor Prevalence 35

COVID-19 Pandemic: A Collection of Relevant Publications from Military Medicine 36

DoD COVID-19 Practice Management Guide: Clinical Management of COVID-19 36

TRANSCOM/AMC Commercial Aircraft Cabin Aerosol Dispersion Tests [Revisions]....37

Just the facts: What drugs are safe and effective for COVID-19....38

Neurologic Complications of COVID-19 39

TMPRSS2 and TMPRSS4 Promote SARS-CoV-2 infection of Human Small Intestinal Enterocytes 39

Biological and Epidemiological Trends in the Prevalence and Mortality Due to Outbreaks of Novel Coronavirus COVID-19....40

Caring for Patients with Pain During the COVID-19 Pandemic: Consensus Recommendations from an International Expert Panel 41

Recommendations From the CSO-HNS Taskforce on Performance of Tracheotomy During the COVID-19 Pandemic 42

Smell and Taste Dysfunction in Patients With COVID-19 43

Special Report on Protecting Patient Health Information During the COVID-19 Pandemic 44

Model Projections: Expected Timelines and Infection Impact for an Outbreak of COVID-19 on a USN Capital Ship....45

Caring for Patients' Mental Well Being During Coronavirus and Other Emerging Infectious Diseases: A Guide for Clinicians....46

Just the Facts: What are the roles of oxygen escalation and noninvasive ventilation in COVID-19...46

Cytokine Release Syndrome in Severe COVID 19: Lessons From Arthritis and Cell Therapy in Cancer Patients Point to Therapy for Severe Disease 47

Continuing Operations 48

Adjusting Fire - Piloting an Online Sleep Class in a U.S. Air Force Population in Response to COVID-19 Patient Care Restrictions 48

The COVID-19 Pandemic in Sub-Saharan Africa: An Opportunity to Rethink Strategic Competition on the Continent 49

The Financial Impact of Corona Virus Disease 19 on Department of Defense Telework Capability ..49

Evaluating the Impact of COVID-19 Based Restrictions on the Sleep and Sleep Behaviors of Airmen During Technical Training 50

Readiness Implications of Coronavirus Infections on U.S. Navy Ships 50

The Application of Strategic Leadership to the COVID 19 Pandemic and its Impact on US Military Operations 51

Selective AAK1 and GAK Inhibitors for Combating Dengue and other Emerging Viral Infections 51

An Outbreak of Covid-19 on an Aircraft Carrier 52

AFRICA WATCH COVID-19 Edition, Volume 23 53

Adrift: COVID-19 and the Safety of Seafarers 53

Evaluation of the Biomeme Franklin Human Performance Factors 54

COVID-19 Planning Dashboard and Guidance for Global Aviation Interests 54

COVID-19 Monitoring and Response for U.S. Air Force Military Basic Trainees -Texas, March-April 2020 55

Special Edition: Response to COVID-19 56

Emerging Infectious Disease Diagnostic via Novel Optoelectronic Halo Effect 56

COVID-19 and the Ethics of Military Readiness 57

Discovery and Synthesis of GS-5734, a Phosphoramidate Prodrug of a Pyrrolo[2,1 f][triazin-4-amino] Adenine C-Nucleoside for the Treatment of Ebola and Emerging Viruses 58

Coronavirus Research 59

Literature Review on Oral Routes of Infection for SARS-CoV-2 in Animals and Humans 59

InfoForager: Leveraging Semantic Search with AMR for COVID-19 Research 60

Whole-genome Sequencing of SARS CoV 2: Using Phylogeny and Structural Modeling to Contextualize Local Viral Evolution 60

Temperature and Humidity Effects on SARS-CoV-2 and Related Coronaviruses 61

Alternatives to Viral Transport Medium for Use in SARS-CoV-2 Sample Preparation 62

Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1 62

Interferon-Beta 1a and SARS Coronavirus Replication 63

Interactions of Rodent Coronaviruses with Cellular Receptors 64

Anticipating Viral Species Jumps: Bioinformatics and Data Needs 65

Distinct Patterns of IFITM-Mediated Restriction of Filoviruses, SARS Coronavirus, and Influenza A Virus 65

Decontamination....67

ESP-DLux - Automated Germicidal Light Infection Control/Biosecurity System 67

Quantitative Efficacy of Common Virucidal Disinfectants Against Viral Surrogates on Porous and Nonporous Surfaces 67

InfoForager: Leveraging Semantic Search with AMR for COVID-19 Research 68

Use of Ultraviolet Germicidal Irradiation (UVGI) for COVID-19 Decontamination Purposes 68

N95 Filtering Facepiece Respirator Ultraviolet Germicidal Irradiation (UVGI) Process for Decontamination and Reuse....69

Defense Production Act....70

New COVID-19 Defense Production Act (DPA) Actions: Implementation Considerations 70

COVID-19: Defense Production Act (DPA) Developments and Issues for Congress 70

COVID-19: Industrial Mobilization and Defense Production Act (DPA) Implementation 71

Defense Production Act: Purpose and Scope 71

DEFENSE PRODUCTION ACT: Agencies Lack Policies and Guidance for Use of Key Authorities 72

The Defense Production Act of 1950: Vital Defense and Emergency Acquisition Authority for 2002 73

Credible Mobilization Crucial for the Defense of the Nation 73

Government Response 74

Misinformation 74

You Can't Quarantine the Truth: Lessons Learned in Logical Fallacy Annotation of an Infodemic 74

Digital Deception: The Cognitive and Social Mechanisms of the Spread of Fake News 75

Telling China's COVID-19 Story Well: Beijing's Efforts to Control Information and Shape Public Narratives Regarding the 2020 Global Pandemic....75

Effects of COVID-19 on the U.S. and Globe 76

Global Economic Effects of COVID-19 76

Plagues and Power: The Evolutionary Influence of Disease on Great Power Competition 77

The Effect of COVID-19 on Small Businesses in Greece....77

Post-COVID-19 European Strategic Opportunities: An Inquiry into Strategic Great Power 78

Are We There Yet? Using the Push-Pull Theory to Address Latin American Migration to the U.S. During COVID-19 79

Africa Watch. COVID-19 Edition....80

The Pandemic's Prod: Revamping America's Strategy for Rapid AI Implementation 80

Disaster Recovery: COVID-19 Pandemic Intensifies Disaster Recovery Challenges for K-12 Schools.81

Unequal Effects of the COVID-19 Pandemic on Scientists 81

PEPFAR's response to the convergence of the HIV and COVID-19 pandemics in Sub-Saharan Africa 82

Strategic Multilayer Assessment Special Topics Paper: The COVID Crisis: Implications for United States- and Global- Biosecurity 83

The Chinese Dream Has Awakened to a Global Nightmare: A Case for US-China Cooperative Security to Regain Stability in the Wake of Coronavirus 83

Federal Policy, Cares Act, and Evaluations 84

Processing Policy in a Pandemic 84

Evaluation of Access to Department of Defense Information Technology and Communications During the Coronavirus Disease 2019 Pandemic 85

Audit of Contracts for DoD Information Technology Products and Services Procured by DoD Components in Response to the Coronavirus Disease-2019 Pandemic 85

COVID-19: Key Insights from GAO's Oversight of the Federal Public Health Response 86

Tackling Urgent Health Security Risks During the COVID-19 Pandemic 87

Audit of Department of Defense Implementation of Section 3610 of the Coronavirus Aid, Relief, and Economic Security Act 88

COVID-19 and Domestic PPE Production and Distribution: Issues and Policy Options 88

Financial Assistance: Lessons Learned from CARES Act Loan Program for Aviation and Other Eligible Businesses 89

COVID-19: Federal Efforts Could Be Strengthened by Timely and Concerted Actions 90

Federalism: Opportunities Exist to Improve Coordination and Consultation with State and Local Governments 90

Planning For On-Campus K-12 Education During Covid-19 91

COVID 19: Opportunities to Improve Federal Response and Recovery Efforts 92

Audit of Contracts for Equipment and Supplies in Support of the Coronavirus Disease - 2019 (COVID-19) Pandemic 93

Congressional Oversight Provisions in the Coronavirus Aid, Relief, and Economic Security (CARES) Act (P.L. 116-136) 94

Domestic Public Health Response to COVID-19: Current Status and Resources Guide 94

Department of Veterans Affairs' Potential Role in Addressing the COVID-19 Outbreak 94

Another Coronavirus Emerges: U.S. Domestic Response to 2019-nCoV 95

Assessing Options for COVID-19 Payment Integrity Analytic Cells 96

DoD Assistance and Lessons Learned 96

The National Guard and the COVID-19 Pandemic Response 96

Audit of Dual-Status Commanders for Use in Defense Support of Civil Authorities Missions in Support of the Coronavirus Disease-2019 Pandemic 97

SARS-CoV-2 in the U.S. Military - Lessons for Civil Society 98

A Leader's Guide to Crisis Communication: Lessons from Ebola for COVID-19 98

DARPA's Pandemic-Related Programs 99

Memorandum for SECDEF: Restore "Shock" in Strategic Planning 100

COVID-19: Defense Support of Civil Authorities 100

Overview: The Department of Defense and COVID-19 101

Methods of Testing, Assays, and Reagents 101

A New, Simple, Rapid, On-Site Test for Detection of and Prevention from SARS-CoV Viruses 101

COVID-19 Testing: Frequently Asked Questions 102

Evaluation of the Biomeme Franklin Human Performance Factors: Final Report 103

Universal and Serial Laboratory Testing for SARS-CoV-2 at a Long-Term Care Skilled Nursing Facility for Veterans-Los Angeles, California, 2020 104

Development and Commercialization of Analyte Specific Reagents (ASRs) for the Diagnosis of Selected Arthropod-Borne Viruses on FDA-Cleared Real-time PCR Platforms 105

Diversity, Replication, Pathogenicity and Cell Biology of Crimean Congo Hemorrhagic Fever Virus 106

Dual-Probe Real-Time PCR Assay for Detection of Variola or Other Orthopoxviruses with Dried Reagents 107

Bacterial-based Systems for Expression and Purification of Recombinant Lassa Virus Proteins of Immunological Relevance 108

Biological Agent Sample Preparation for the Detection and Identification of Multiple Agents by Nucleic Acid-Based Analysis 109

Pandemic Response Plans- Limited Sources and Surges 110

Summary of Strategies to Increase the Availability of ICU Ventilator Capability to COVID-19 Patients with Respiratory Failure 110

Hospital Viability during a Pandemic Influenza Outbreak 110

Regional Mass Fatality Management in Pandemic Surge 111

Pandemic Responses and Plans 112

Preparing for the Next Pandemic: How Can Navy Personal Protective Equipment Resupply Be Improved? 112

Depot Maintenance: DoD Should Improve Pandemic Plans and Publish Working Capital Fund Policy 113

COVID-19: Urgent Actions Needed to Better Ensure an Effective Federal Response 113

Preparing The USAF Contracting Career Field for the Next Humanitarian Assistance Disaster Response Within the Continental United States 114

Coronavirus Disease 2019 (COVID-19) Pandemic: Review of Guidelines for Resuming Non-urgent Imaging and Procedures in Radiology During Phase 2 115

Advanced Preparation Makes Research in Emergencies and Isolation Care Possible: The Case of Novel Coronavirus Disease (COVID-19) 116

Urban Outbreak 2019 Pandemic Response: Select Research and Game Findings 117

National Biodefense Strategy: Opportunities and Challenges with Early Implementation 118

Periodic Refresher Emails for Emergency Department Mass Casualty Incident Plans 118

A Model Of Creating Inpatient Hospital Surge Capacity Through Early Discharge 119

Defense Civil Support: DOD, HHS, and DHS Should Use Existing Coordination Mechanisms to Improve Their Pandemic Preparedness 120

Surviving the Storm: Expanding Public Health's Capabilities in Response to the Increasing Threats Posed by Novel Viruses 120

Personal Protective Equipment (PPE) 121

Personal Protective Equipment Optimization Validation 121

DIY Face Mask Effectiveness Against COVID-19 122

Aerosol Filtration Efficiency of Common Fabrics Used in Respiratory Cloth Masks 123

Development of an Advanced Respirator Fit Test Headform (Postprint) 124

A Pandemic Influenza Preparedness Study: Use of Energetic Methods to Decontaminate Filtering Facepiece Respirators Contaminated with H1N1 Aerosols and Droplets (POSTPRINT) 125

Stopping the Spread 126

Estimators for Disease Dynamics with Imperfect Surveillance 126

Before and After: The Impact of the COVID-19 Pandemic on Influenza-Like Illness Trends in PAIVED 127

Compliance and Performance Characteristics of Subject Collected Versus Health-care Worker Collected Nasal Swabs for Respiratory Viral Surveillance 128

Halting Covid-19: PANDEMIC - A Predictive Model to Guide Response 129

Comparison of Next Generation Diagnostic Systems (NGDS) for the Detection of SARS-CoV-2 130

Comparison of Next Generation Diagnostic Systems (NDGS) for the Detection of SARS-CoV-2 [Poster] 131

PANDEMIC: To Simulate Infection Spread in a Complex Environment 131

Genomic Surveillance of SARS-CoV-2 132

COVID-19 Case and Contact Investigation in an Office Workspace 133

Transparency through Complex Interdependence: Vietnam's Surveillance and Reporting of Emerging Infectious Diseases in the Twenty-First Century 134

Privacy Risk Assessment of a DON Digital Contact Tracing System Using the NIST Privacy Framework 135

SARS-COV-2 Dissemination Using United States County Adjacencies 135

Questioning COVID-19 Surface Stability and Fomite Spreading in Three Aeromedical Cases: A Case Series 136

The Effect of Arrival Quarantine on Subsequent COVID-19 Testing in a Cohort of Military Basic Trainees 137

Development of Highly Sensitive Goggle for Fluorescence-Based Detection of Middle East Respiratory Syndrome Coronavirus (MERS CoV) and Other Pathogens 138

COVID-19 Case and Contact Investigation in an Office Workspace 139

COVID-19 Monitoring and Response Among US Air Force Basic Military Trainees 140

COVID-19 Testing: Key Issues 141

Stopping COVID-19: Short-Term Actions for Long-Term Impact 141

National Biodefense Strategy: Opportunities and Challenges with Early Implementation 141

Controlling the Spread of Contagious Disease in an Operational Environment 142

Project BioShield: Authorities, Appropriations, Acquisitions, and Issues for Congress 143

Vaccines 144

Prevaccination Against COVID-19 Among Air Force Military Recruits 144

Domestic Funding for COVID-19 Vaccines: An Overview 144

Sequencing SARS-CoV-2 from Antigen Tests 145

COVID-19 Vaccination: Selected U.S. Data Sources 145

Processes and Best Practices from the US Navy Vaccination Center at Bloch Arena 146

COVID-19 Vaccine: Financing for Its Administration 147

COVID-19 Vaccine Doses: Selected Data Sources on Allocation, Distribution, and Administration . 148

Operation Warp Speed: Accelerated COVID-19 Vaccine Development Status and Efforts to Address Manufacturing Challenges 148

COVID-19 Critical Vaccine Distribution, Supply Chain, Program Integrity, and Other Challenges Require Focused Federal Attention 149

Funding for COVID-19 Vaccines: An Overview 150

Operation Warp Speed Contracts for COVID-19 Vaccines and Ancillary Vaccination Materials 151

COVID-19: Federal Efforts Accelerate Vaccine and Therapeutic Development, but More Transparency Needed on Emergency Use Authorizations 151

COVID-19, Federal Efforts Accelerate Vaccine and Therapeutic Development, but More Transparency Needed on Emergency Use Authorizations 152

MERS-CoV and H7N9 Influenza Assay Development on NGDX 153

Author Index 155

Subject Index 163

Aerosol Viruses

Airborne Transmission Risk: Ventilation and Filtration in Occupied Buildings During the SARS-Cov-2 Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148970	2021-03-01	Approved for Public Release
Author:	Carta, Alessandro	
Corporate Author:	Centre for Maritime Research and Experimentation La Spezia	
Descriptors:	• health services • volatile organic compounds • particle size • air flow • environment • environmental pollutants • filtration • heat recovery • airway management • filters	
During the SARS-CoV-2 pandemic, many mitigation strategies have been employed to reduce the risk of transmission between individuals, including hygienic practices such as washing hands and objects frequently, wearing face masks, maintaining social distance between people, reducing room occupancy and tracking the health status of individuals. This document examines mitigation strategies related to airborne transmission of the SARS-CoV-2 virus inside occupied buildings. Topics covered include the impact of air conditioning and ventilation systems on the potential spread of SARS-CoV-2, recommendations for best practices, and the effectiveness of filtration on mitigating the risk of contagion.		

Aerosol and surface contamination of SARS-CoV-2 observed in quarantine and isolation care		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105922	2020-07-29	Approved for Public Release
Author:	• Santarpia, Joshua L. • Rivera, Danielle N. • Herrera,Vicki L. • Morwitzer, M. J. • Creager, Hannah M. • Santarpia, George W. • Crown, Kevin K. • Brett-Major, David M • Schnaubelt, Elizabeth R. • Broadhurst, M. J. • Lawler, James V. • Reid, Patrick	

	• Lowe, John J.
Corporate Author:	University of Nebraska, Omaha, NE
Descriptors:	• respiration disorders • respiratory tract diseases • aerosols • contamination • quarantine • patient care • biomedical research • public health • health services • medical personnel
The novel Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) originated in Wuhan, China in late 2019, and its resulting coronavirus disease, COVID-19, was declared a pandemic by the World Health Organization on March 11, 2020. The rapid global spread of COVID-19 represents perhaps the most significant public health emergency in a century. As the pandemic progressed, a continued paucity of evidence on routes of SARS-CoV-2 transmission has resulted in shifting infection prevention and control guidelines between classically-defined airborne and droplet precautions. During the initial isolation of 13 individuals with COVID-19 at the University of Nebraska Medical Center, we collected air and surface samples to examine viral shedding from isolated individuals. We detected viral contamination among all samples, supporting the use of airborne isolation precautions when caring for COVID-19 patients.	

COVID-19 Virus Shedding		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1106242	2020-04-23	Approved for Public Release
Author:	Trice, Joshua	
Corporate Author:	ABSS Solutions, Inc. Upper Marlboro, MD	
Descriptors:	• ribonucleic acids • personal protective equipment • infectious disease transmission • decision making	
As of December 2019, the SARS-CoV-2 virus responsible for the COVID-19 disease has been rapidly spreading throughout the world. In order to understand the spread, viral shedding characteristics, which refers to the release of the virus from an infected individual into the environment, must be determined. As we are currently in the middle of the COVID-19 pandemic, additional research is required to fully understand the characteristics of SARS-CoV-2 shedding.		

Asymptomatic Shedding of Respiratory Virus Among an Ambulatory Population Across Seasons		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1090961	2018-07-11	Approved for Public Release
Author:	• Birger, Ruthie • Morita, Haruka • Comito, Devon • Filip, Ioan • Galanti, Marta • Lane, Benjamin • Ligon, Chanel • Rosenbloom, Daniel • Shittu, Atinuke • Ud-Dean, Minhaz • Desalle, Rob • Planet, Paul • Shaman, Jeffrey	
Corporate Author:	Columbia University New York United States	
Descriptors:	• respiratory tract diseases • public health • influenza • environmental health • infection • pain	

Most observation of human respiratory virus carriage is derived from medical surveillance however, the infections documented by this surveillance represent only a symptomatic fraction of the total infected population. As the role of asymptomatic infection in respiratory virus transmission is still largely unknown and rates of asymptomatic shedding are not well constrained, it is important to obtain more-precise estimates through alternative sampling methods. We actively recruited participants from among visitors to a New York City tourist attraction. Nasopharyngeal swabs, demographics, and survey information on symptoms, medical history, and recent travel were obtained from 2,685 adults over two seasonal arms. We used multiplex PCR to test swab specimens for a selection of common respiratory viruses. A total of 6.2 of samples 168 individuals tested positive for at least one virus, with 5.6 testing positive in the summer arm and 7.0 testing positive in the winter arm. Of these, 85 50.6 were positive for human rhinovirus HRV, 65 38.7 for coronavirus (CoV), and 18 10.2 for other viruses including adenovirus, human metapneumovirus, influenza virus, and parainfluenza virus. Depending on the definition of symptomatic infection, 65 to 97 of infections were classified as asymptomatic. The best-fit model for prediction of positivity across all viruses included a symptom severity score, Hispanic ethnicity data, and age category, though there were slight differences across the seasonal arms. Though having symptoms is predictive of

virus positivity, there are high levels of asymptomatic respiratory virus shedding among the members of an ambulatory population in New York City.

An Experimental Investigation of the Performance of a Collison Nebulizer Generating H1N1 Influenza Aerosols		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA623663	2015-04-04	Approved for Public Release
Author:	• Ibrahim, Essam • Harnish, Delbert • Kinney, Kimberly • Heimbuch, Brian • Wander, Joseph	
Corporate Author:	Air Force Civil Engineer Center, Tyndall AFB, FL	
Descriptors:	• aerosols • atomization • influenza virus • particle size • viability	
The performance of a Collison nebulizer delivering viable H1N1 influenza aerosols was assessed in terms of particle size distribution PSD and survivability of the virus upon generation. An H1N1 influenza virus preparation in egg allantoic fluid was diluted in sterile deionized water to a concentration of 3.4 106 TCID50mL. The virus suspension was aerosolized at air flow rates of 2, 6 and 12 Lmin using a 1-jet, 3-jet and 6-jet Collison nebulizer, respectively. A scanning mobility particle sizer measured the PSD of the viral aerosol after steady-state delivery times of 1, 15, 30, 45 and 60 min. After 60 min of continuous aerosolization, the viral titre was unchanged and the count median diameter CMD of the aerosol PSD was 38 nm for the 2 Lmin flow rate, 35 nm for the 6 Lmin flow rate and 33 nm for the 12 Lmin flow rate. The CMDs were much smaller than the influenza virus 80 120 nm, indicating the aerosol distribution comprised mainly nonviable materials. The PSD produced by the Collison nebulizer exhibited a 20 increase in peak particle concentration after 60 min of continuous operation at 12 Lmin. This progressive increase in particle counts may be attributed to a combination of evaporation and shear and impact stresses imparted on components by the Collison nebulizer. The possible slight loss in H1N1 influenza viability over the course of 60 min of continuous aerosolization at 12 Lmin is consistent with previous bioaerosol studies using a Collison nebulizer.		

Aerosol-phase Activity of Iodine Captured from a Triiodide Resin Filter on Fine Particles Containing an Infectious Virus		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA620340	2015-01-01	Approved for Public Release

Author:	• Heimbuch, Brian K. • Harnish, David A. • Lumley, April • Kinney, K. • Balzli, C.
Corporate Author:	Air Force Civil Engineer Center, Tyndall AFB, FL
Descriptors:	• bactoriophages • aerosols • iodine • antimicrobial agents • filters • particles • respiratory system
The triiodide form of an anion-exchange resin an effective antimicrobial in water is claimer to attenuate infectivity of airborne microorganisms. However, attempts to evaluate the effect of passage through a filter medium containing the triiodide resin were impeded by reactions of iodine with proteins during collection and with water during analysis. Aerosols of MS2 coli phage were passed through control P100 and iodinated HEPA media, collected in plastic bags, incubated for 0 10 min, collected in an impinger containing thiosulfate to consume unreacted iodine, plated and enumerated. Comparison of viable counts demonstrated antimicrobial activity with an apparent half-life in tens of seconds. Antimicrobial effectiveness increased with relative humidity. Absorption of iodine by the bags eliminated reaction with free iodine as a contributing mechanism. The iodinated medium appears to have possible use in collective, but likely not individual, protection.	

Evaluation of the Performance of Iodine-Treated Biocidal Filters Under the Influence of Environmental Parameters		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA586855	2013-02-01	Approved for Public Release
Author:	• Woo, Myung-Heui • Li, Hsing-Wang • Wu, Chang-Yu	
Descriptors:	• air filters • disinfection • iodine • biological aerosols • contamination • humidity • irradiation • microorganisms • threats	

	• ultraviolet lamps

This project final report summarizes a collaborative effort to evaluate the ability of a patented product in which a contact-transfer disinfectant, poly4-styrenetrimethylammoniummethyl triiodide PSTI is incorporated into an air filter medium to disinfect penetrating bioaerosols. After several false starts a quenching experiment capturing MS2 phage particles filtered through PSTI and captured in thiosulfate solution in an impinger showed that the iodine--aerosol chemistry is slow, and that earlier work based on capture-and-culture methods are blinded by the efficiency of kill by iodine in any aqueous medium. Moderate dependencies of bioaerosol characteristics and stability on environmental conditions and delivery medium were measured and reported. A device and method to achieve reproducible, controlled deposition of viable viral and bacterial aerosol droplets was developed, which created a tool for standardized contamination of test articles that can be used to quantify and compare cleaning and decontamination methods. Alternative approaches to on-the-fly disinfection were developed and tested as possible alternatives to PSTI or another reactive air filtration medium as an enhancement to protectivity of next-generation individual and collective respiratory protective gear---particularly in potentially infective environments---and HVAC filters.

Inactivation of Aerosolized Biological Agents using Filled Nanocomposite Materials		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA574012	2013-02-01	Approved for Public Release
Author:	• Grinshpun, S. A. • Schoenitz, M. • Dreizin, E. • Adhikari, A. • Reponen, T. • Yermakov, M.	
Corporate Author:	Cincinnati University, OH	
Descriptors:	• biological agents • composite materials • air flow • airborne • bacillus subtilis • biological aerosols • combustion • energetic properties • iodine • pathogenic microorganisms • spores	

In this multi-institutional grant, a new method for inactivating aerosolized biological agents was developed utilizing a new class of energetic materials filled nanocomposite materials.

The implemented approach enabled a controllable release of iodine-based oxidizing species in the combustion environment to inactivate viable airborne bio-agents, such as stress-resistant bacterial spores and viruses. Composites with adjustable AlI2 ratios were produced. A state-of-the-art experimental facility was developed for studying how novel energetic formulations and their combustion products affect the viability of aerosolized spores and viruses during a short 1s exposure times. Controlled bioaerosol dispersal and sample collection protocols were developed and optimized. The dry-heat inactivation of aerosolized spores was quantified separately from chemical effects and linked to DNA repair mechanisms. It was concluded that the iodine-containing powder provided significantly more effective inactivation of airborne spores than non-iodinated powders. The results of this research help to better understand physical, physicochemical, and biological properties associated with inactivation of aerosolized bio-agents in combustion environments.

Disinfection of Airborne Organisms by Ultraviolet-C Radiation and Sunlight		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA566495	2012-07-01	Approved for Public Release
Author:	• Kesavan, Jana • Sagripanti, Jose-Luis	
Corporate Author:	Army Edgewood Chemical Biological Center, APG, MD	
Descriptors:	• biological aerosols • ultraviolet radiation • aerosol generators • decontamination • disinfection • sunlight	
This report provides background information on UV radiation, selected organisms of potential interest to aerosol researchers, and an overview of the effects of UV light on aerosolized organisms. Aerosol generation methodology and equipment, as well as test methodology used at U.S. Army Edgewood Chemical Biological Center ECBC, are provided as examples for researchers to compare to their own methodology or as guidance for those newer to this field.		

Improving Protection against Viral Aerosols Through Development of Novel Decontamination Methods and Characterization of Viral Aerosol		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA564821	2012-04-01	Approved for Public Release
Author:	Woo, Myung-Huei	
Corporate Author:	Florida University Gainesville, Department of Environmental Engineering Sciences.	
Descriptors:	• influenza	

	• aerosols • air filters • decontamination • filtration • respirators
Although respirators and filters are designed to prevent the spread of pathogenic aerosols, a stockpile shortage is anticipated during the next flu pandemic. Contact transfer and re-aerosolization are also concerns. An option to address these potential problems is to decontaminate used respirators filters for reuse. In this research a droplet aerosol loading chamber was built and used in decontamination testing to prove a fair comparison of the performance of different decontamination techniques, including antimicrobial chemical agents, microwave irradiation and ultraviolet UV irradiation, which were incorporated into filtration systems and tested. The inactivation efficacy of dialdehyde cellulose and starch filters s biocidal filters was investigated. In sufficiently humid conditions both media showed higher removal efficiency and better disinfection capability at lower pressure drop than conventional media. In microwave-assisted filtration systems temperature T was found to be a key factor. Relative humidity RH was another pivotal parameter at warm-to-hot-water temperatures but became insignificant above 90 C. An examination of the effect of T and RH on UV inactivation revealed that absorption of UV by water and shielding of viruses inside aggregates suppressed inactivation. Varying the spray medium showed that artificial saliva AS and beef serum extract BE produce a protective effect against UV compared to deionized DI water, that RH was not a factor in stability of MS2 coli phage sprayed in AS or BE, and that infectious MS2 particles in DI water displayed a volume-based size distribution but in AS and in BE the size dependence was of a lower order. Whereas AS and BE enhanced stability, adding salts had the opposite effect.	

Biological Aerosol Test Method and Personal Protective Equipment (PPE) Decontamination		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA545225	2011-05-01	Approved for Public Release
Author:	• Hinrichs, Steven H. • Lore, Michael B. • Brown, TeAnne L.	
Corporate Author:	Nebraska University Medical Center, Omaha NE	
Descriptors:	• biological aerosols • decontamination • infectious diseases • respiratory system • secretion • drops • dyes • filters	

	• heat • irradiation • protective equipment • respirators • sampling • ultraviolet radiation

Capability to simulate surface deposition of contagious droplets from human respiratory secretions, developed for use in a BSL3 laboratory at the University of Nebraska Medical Center UNMC, was used to quantitatively assess the effects of three decontamination methods: microwave steam, moist heat, ultraviolet germicidal irradiation on viable infectious influenza virus AH5N1. This report describes this capability, including laboratory techniques and methods used to test and analyze samples. UNMC will use this capability for aerosol-related research at to evaluate effectiveness of personal respirator protection devices. This effort evaluated technologies for disinfecting filtering facepiece respirators FFRs by aerosolizing, sampling, and analyzing viability of AH5N1 virus on FFRs. Objectives included supporting and enhancing collection of quality data, characterizing and optimizing the aerosol test systems and supplementary data quantification using real-time polymerase chain reaction assays. AFRL supplied two aerosol surface deposition test systems used to apply virus to the FFRs These test systems were the Laboratory-Scale Aerosol Test System and Droplet Loading Device. Performance of both was validated in UNMC's BSL3 laboratory, first with colored dyes to ensure equal distribution of aerosol across the system, then with viable virus, which verified system operations within design parameters. AFRL's protocols were utilized throughout unless otherwise specified. FFRs were loaded with virus, subjected to one of the decontamination methods, then assayed for viable virus. All three treatments reduced viable virus concentrations by 8805 4 log10 TCID50.

High Volume Air Sampling for Viral Aerosols: A Comparative Approach		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA519642	2010-03-01	Approved for Public Release
Author:	Cooper, Casey W.	
Corporate Author:	Air Force Institute of Technology, Wright-Patterson AFB, OH	
Descriptors:	• biological agent detectors • decontamination • biological aerosols • biological contamination • sampling • assaying • bioassay • bleaching agents • hypochlorites • polymerization	

	• bioterrorism • particle size

The United States Air Force has high volume biological air sampling equipment available including the XMX2L-MIL and DFU-1000. Neither system has been evaluated for effectiveness in the collection of viruses. Furthermore, decontamination methods have not been evaluated for these systems after use in sampling for a viral agent. MS2 bacteriophage was used as a surrogate virus. Aerosolized MS2 was released into a 12 m3 exposure chamber. High and moderate airborne concentrations of MS2 were evaluated. Low volume impingers were used for comparative purposes as well. Samples were analyzed using plaque assay and polymerase chain reaction PCR. At high viral loads the XMX2L-MIL and DFU-1000 achieved collection effectiveness equal to or greater than the low volume impingers. At moderate levels of airborne viral load, the XMX2L-MIL was capable of collecting viral quantities within 25 of the quantities collected by the low volume impingers. The DFU-1000 achieved marginal collection effectiveness of virus at moderate concentrations compared to the XMX2L-MIL and is considered to be unreliable in the quantification of viral agent at moderate levels and below. The DFU-1000 and XMX2L-MIL were capable of collecting detectable MS2 with PCR analysis at all concentrations. Ten percent sodium hypochlorite commercial bleach solution effectively decontaminated MS2.

Challenge of N95 and P100 Filtering Facepiece Respirators with Particles Containing Viable H1N1		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA631314	2009-12-02	Approved for Public Release
Author:	• Wander, Joseph D. • Heimbuch, Brian	
Corporate Author:	Applied Research Associates INC, Panama City, FL	
Descriptors:	• influenza virus • aerosols • protective mask • public health • respirator	

3M1860s N95 and 3M 8293 P100 NIOSH-approved filtering facepiece respirators FFRs were challenged with aerosolized particles of H1N1 influenza to measure the amount of viable influenza virus that penetrates each device. The test was conducted at the NIOSH-recommended flowrate of 85 LPM using guidance provided by a Department of Defense test standard developed for challenging air purification devices with viable microbial aerosols. The count mode diameter CMD particle size of the challenge aerosol was approximate 0.8 microns, which was created by aerosolizing H1N1 influenza virus in an artificial saliva buffer using the Laboratory-Scale Aerosol Tunnel LSAT. In addition to the H1N1 challenge, each FFR was also challenged with 0.8- microns inert beads. In these tests the N95 FFR n 3 removed 99 of the viable H1N1 from the air stream and the P100 n 3 removed 99.99 of viable H1N1 from the airstream. The percent reductions in mechanical and viable particle counts measured for

each FFR using the 0.8- microns bead challenge were equivalent to the percent reduction values measured for like-sized particles containing H1N1, verifying that bioaerosols act as typical particles. These data demonstrate that the N95 and P100 FFR will reduce viable H1N1 aerosol from the airstream at greater than or equal to their rated value.

Care of Patients

Descriptive Analysis of COVID-19 Aeromedical Evacuations by Critical Care Air Transport Teams		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151852	2021-11-01	Approved for Public Release
Author:	• Davis, William T • Ng, Patrick C • Cutright, Julie E • Savell, Shelia C • Arana, Allyson A • McCarvel, Brooks • Maddry, Joseph K	
Corporate Author:	United States Air Force, En Route Care Research Center, 59th Medical Wing.	
Descriptors:	• medical personnel • health services • Air Force • antiviral agents • airway management • military medicine • pain • aeromedical evacuation • hygiene • patient care • disease outbreaks • virus diseases	
Preserving aeromedical evacuation capabilities for critically ill patients with COVID-19 required innovation for en-route care logistics, training, and equipment. The aim of this study was to describe characteristics and in-flight interventions for patients with suspected COVID-19 requiring aeromedical evacuation by U.S. Air Force Critical Care Air Transport Teams CCATT.		

Low Cost, High-Throughput 3D Pulmonary Imaging Using Hyperpolarized Propane Gas		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1155555	2021-08-01	Approved for Public Release

Author:	Chekmenev, Eduard Y.
Corporate Author:	Wayne State University, Detroit, MI

This report covers the first year of this three-year project. During the indicated period of performance, we have focused our activities on two specific aims. With regards to Aim 1 to develop a clinical low-cost and high-throughput device for production and administration of HP propane contrast agent for ultimate research use in volunteers, we have designed the proposed device and have been testing this device. With respect to Aim 2 To develop a safe method for HP propane gas administration and utilization, and test the purity and safety of the HP contrast agent produced by our device we have been primarily focusing on developing approaches and testing the quality of the produced gas in the context of reaction completeness. While the progress of working on all aims of this project has been substantially impacted by the COVID-19 pandemic, we could not make any progress towards Aim 3 To assess the feasibility of MRI using HP propane gas for in vivo functional imaging of normal lungs and in a bleomycin-induced COPD model in sheep primarily because the required instrumentation 0.35 T MRI installation process could not be completed due to the pandemic restrictions. We expect to make substantially more progress towards all three aims of the project in the next year after the pandemic-related restrictions have been largely lifted and both performance sites have been re-opened.

A Retrospective Review of Emergency Department Visits That May Be Appropriate for Management in Non-Emergency Settings

Accession Number:	Report Date:	Access Restrictions:
AD1143459	2021-07-19	Approved for Public Release
Author:	• Tapia, Ashley D. • Howard, Jeffrey T. • Bebo, Natasha L. • Pfaff, James A. • Chin, Eric J. • Trueblood, Wesley A. • April, Michael D. • Long, Brit • Long, Adrianna • Fernandez, William • Schauer, Steven G.	
Corporate Author:	Brooke Army Medical Center, Fort Sam Houston, TX	

Emergency departments (ED) continues to struggle with overcrowding, increasing wait times, and a surge in patients with non-urgent conditions. Patients frequently choose the ED for non-emergent medical issues or injuries that could readily be handled in a primary care setting. We analyzed encounters in the ED at the Brooke Army Medical Center the largest hospital in the Department of Defense to determine the percentage of visits that could potentially be managed in a lower cost, appointment-based setting. We conducted a

retrospective chart review of patients within our electronic medical record system from September 2019 to August 2020 which represented equidistance from the start of the COVID-19 pandemic resulting in a shift in ED used based on previously published data. Our study also compared the number of ED visits pre-covid vs. post-covid. We defined visits to be primary care eligible, if they were discharged home and received no computed tomography imaging, ultrasound, magnetic resonance imaging, intravenous medications, or intramuscular controlled substances. During the 12-month period, we queried data on 75,205 patient charts. We categorized 59 n42,647 of visits as primary care eligible within our chart review. However, the proportion of patient visits that qualified as primary care eligible was generally consistent. We assessed over half of all emergency department admissions could be primary care eligible. Our findings suggest that our patient population may benefit from offering additional lower-cost, appointment-based healthcare delivery to decompress the ED.

Improved adherence to best practice ventilation management after implementation of Clinical Practice Guideline (CPG) for United States military Critical Care Air Transport Teams (CCATTs)

Accession Number:	**Report Date:**	**Access Restrictions:**
AD1136637	2021-06-16	Approved for Public Release
Author:	• Maddry, Joseph K. • Mora, Alejandra G. • Perez, Crystal A. • Arana, Allyson A. • Medellin, Kimberly L. • Paciocco, Joni A. • Ng, Patrick C. • Davis, William T. • Hunninghake, John C. • Bebarta, Vikhyat S.	
Corporate Author:	Air Force Medical Wing (59th), Lackland AFB, Texas	

Critical Care Air Transport Teams (CCATTs) play a vital role in the transport and care of critically ill and injured patients in the combat theater, to include mechanically ventilated patients. Previous research has demonstrated improved morbidity and mortality when lung protective ventilation strategies are used. Our previous study of CCATT trauma patients demonstrated frequent non-adherence to the Acute Respiratory Distress Syndrome Network (ARDSNet) protocol and a corresponding association with increased mortality. The goal of our study was to examine CCATT adherence with ARDSNet guidelines in non-trauma patients, compare the findings to our previous publication of CCATT trauma patients, and evaluate adherence before and after the publication of the CCATT Ventilator Management Clinical Practice Guideline (CPG).

Development and Advancement of Broad-Spectrum Respiratory Antivirals		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1145288	2021-05-01	Approved for Public Release
Author:	Chanda, Sumit K.	
Corporate Author:	Sanford Burnham Prebys Medical Discovery Institute	
Descriptors:	• health services • medical personnel • chemical synthesis • chemistry • virus diseases • cells • interferon • disease outbreaks • genetics • proteomics • animal diseases • hepatitis • vaccines • epithelial cells • zoonoses • biomedical research	
The overall goal of DABRA is to disrupt the paradigm for the treatment of respiratory viral infection through the development of broad-spectrum inhibitors. These antivirals will effectively treat infections caused by multiple respiratory viruses that impact military readiness, including influenza A and B, coronaviruses, human rhinoviruses, respiratory syncytial virus, and Adenoviruses. In the longer term, we expect these efforts to provide critical proof-of-concept studies that will pave the way for development broad-spectrum therapies for other classes of non-respiratory viruses.		

Guidelines for En Route Medical Care in Present and Future MEDEVAC Operations (COVID SMOG Annex)		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1137956	2021-05-24	Approved for Public Release
Author:	• Powell-Dunford, Nicole • Shackelford, S. • Olins, Eric • Cohen, Jason • Frakes, Michael • Denison, Todd • Coughlin, Branden • Johnson, James	

	• Bishop, Michael • Fondy, Susan • Cummings, Kevin • Jacques, Mark • Davenport, Matthew L. • Demorest, Kelsey M. • Eshelman, Robert E. • Molles, Jeffrey J. • Gerstner, Jason • Buatti, Joseph
Corporate Author:	Army Aeromedical Research Laboratory, Fort Rucker, AL
Although the authority for the transport of COVID patients resides with USTRANSCOM, it is imperative that MEDEVAC Companies be afforded the most evidenced based and holistic recommendations regarding the movement of COVID patients. A process improvement study involving 20 aeromedical authorities from 6 nations was conducted. 94 surveys SOPs collected as part of this effort culminated in a virtual international conference conducted on 29 Jan 2021. Notable agencies participating in this process improvement project include U.S. Army MEDEVAC Units, the School of Army Aviation Medicine SAAM, the FAA, our sister services, Joint Trauma Systems and Boston Med Flight. Individual participants in the SME analysis included Enroute Critical Care Nurses, Critical Care Flight Paramedics, MEDEVAC quality and safety executives, pilots, aerospace medicine specialists and emergency medicine physicians. The following recommended practices represent a concurrence of SAAM and Boston MedFlight policies and procedures, with additional subject matter expertise garnered from the 29 January 2021 international teleconference.	

Audit of Infectious Disease Medical Treatment Capabilities at Al Udeid Air Base, Qatar		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1146149	2020-12-21	Approved for Public Release
Author:	Vasquez, Richard B.	
Corporate Author:	Inspector General, Department of Defense, Arlington VA	
The objective of this audit was to determine whether Al Udeid Air Base AUAB, Qatar, had the capabilities to treat coronavirus disease-2019 COVID-19 patients and isolate or quarantine suspected infected service members, civilians, and contractors.		

Baricitinib plus Remdesivir for Hospitalized Adults with Covid-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1118396	2020-12-11	Approved for Public Release
Author:	• Kalil,Andre C. • Patterson,Thomas F. • Mehta,Aneesh K.	

	• Tomashek,Kay M. • Wolfe,Cameron R. • Ghazaryan,Varduhi • Marconi,Vincent C. • Ruiz-Palacios,Guillermo M. • Hsieh,Lanny • Kline,Susan • Tapson,Victor • Iovine,Nicole M. • Jain,Mamta K. • Sweeney,Daniel A. • Sahly,Hana M. • Branche,Angela R. • Pineda,Justino R. • Lye,David C. • Sandkovsky,Uriel • Luetkemeyer,Anne F.
Corporate Author:	Nebraska University Medical Center, Omaha, NE
Descriptors:	• airway management • health services • therapy • patient care
Severe Coronavirus Disease 2019 (Covid-19) is associated with dysregulated inflammation. The effects of combination treatment with baricitinib, a Janus kinase inhibitor, plus remdesivir are not known. We conducted a double-blind, randomized, placebo-controlled trial evaluating baricitinib plus remdesivir in hospitalized adults with Covid-19. All the patients received remdesivir 10 days and either baricitinib 14 days or placebo control. The primary outcome was the time to recovery. The key secondary outcome was clinical status at day 15.	

Elevated Nosocomial Infection Rates in Patients with COVID-19 Requiring Extracorporeal Membrane Oxygenation		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1116335	2020-11-30	Approved for Public Release
Author:	• Marcus, Joseph E. • Sams, Valerie G. • Barsoumian, Alice E.	
Corporate Author:	Brooke Army Medical Center, Fort Sam Houston, TX	
Descriptors:	• health services • infection control • patient care	

	• Air Force • infectious diseases • infection • bacteria • disease outbreaks • diseases and disorders • fungi • internal medicine • hospitalizations • hygiene • therapy • virus diseases • anti-bacterial agents • membranes
A retrospective cohort compared nosocomial infections for patients receiving extracorporeal membrane oxygenation ECMO for influenza or COVID-19. COVID-19 was associated with more infections per 1000 patient days 37.3 vs. 17.7, p0.04 and infections earlier in patients ECMO course median IQR 5 days 3-7 vs. 16 10-21, p0.03 compared to influenza.	

Prone Positioning in Moderate to Severe Acute Respiratory Distress Syndrome Due to COVID-19: A Cohort Study and Analysis of Physiology		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1119174	2020-11-23	Approved for Public Release
Author:	• Shelhamer, Mehdi C. • Wesson, Paul D. • Solari, Ian L. • Jensen, Deanna L. • Steele, William A. • Dimitrov, Vihren G. • Kelly, John D. • Aziz, Shazia • Gutierrez, Victor P. • Vittinghoff, Eric • Chung, Kevin K. • Menon, Vidya P. • Ambris, Herman A. • Baxi, Sanjiv M.	
Corporate Author:	Uniformed Services University of the Health Sciences, Bethesda, MD	
Coronavirus disease 2019 (COVID-19) can lead to acute respiratory distress syndrome (ARDS) but it is unknown whether prone positioning improves outcomes in mechanically ventilated patients with moderate to severe ARDS due to COVID-19. Methods: A cohort study at a New		

York City hospital at the peak of the early pandemic in the United States, under crisis conditions. The aim was to determine the benefit of prone positioning in mechanically ventilated patients with ARDS due to COVID-19. The primary outcome was in-hospital death. Secondary outcomes included changes in physiologic parameters. Fine-Gray competing risks models with stabilized inverse probability treatment weighting (sIPTW) were used to determine the effect of prone positioning on outcomes. In addition, linear mixed effects models (LMM) were used to assess changes in physiology with prone positioning. Results: Out of 335 participants who were intubated and mechanically ventilated, 62 underwent prone positioning, 199 met prone positioning criteria and served as controls and 74 were excluded. The intervention and control groups were similar at baseline. In multivariate-adjusted competing risks models with sIPTW, prone positioning was significantly associated with reduced mortality (SHR 0.61, 95% CI 0.46-0.80, P < 0.005). Using LMM to evaluate the impact of positioning maneuvers on physiological parameters, the oxygenation-saturation index was significantly improved during days 1-3 (P < 0.01) whereas oxygenation-saturation index (OSI), oxygenation-index (OI) and arterial oxygen partial pressure to fractional inspired oxygen (PaO2: FiO2) were significantly improved during days 4-7 (P < 0.05 for all). Conclusions: Prone positioning in patients with moderate to severe ARDS due to COVID-19 is associated with reduced mortality and improved physiologic parameters. One in-hospital death could be averted for every 8 patients treated. Replicating results and scaling the intervention are important, but prone positioning may represent an additional therapeutic option in patients with ARDS due to COVID-19

Evaluation of Department of Defense Medical Treatment Facility Challenges During the Coronavirus Disease-2019 (COVID-19) Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1135639	2020-09-30	Approved for Public Release
Author:	• Hantz, Carolyn • Hull, Theresa S.	
Corporate Author:	Office of the Inspector General, Department of Defense, Alexandria, VA	
The objective of this evaluation was to determine challenges and needs encountered by personnel working at DoD Medical Treatment Facilities MTFs while responding to the coronavirus disease-2019 COVID-19 pandemic. This final report provides the results of the DoD Office of Inspector General's evaluation. We previously provided copies of the draft report and requested written comments on the recommendations. We considered managements comments on the draft report when preparing the final report. These comments are included in the report.		

Supplementary Information for MADVent: A Low-Cost Ventilator for Patients with COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1106943	2020-05-26	Approved for Public Release

Author:	• Vasan,Aditya • Weekes,Reiley • Connacher,William • Sieker,Jeremy • Stambaugh,Mark • Suresh,Preetham • Lee,Daniel E. • Mazzei,William • Schlaepfer,Eric • Vallejos,Theodore • Petersen, Johan • Merritt,Sidney • Petersen,Lonnie • Friend,James
Corporate Author:	AVERT Team, UC San Diego, La Jolla, CA
Descriptors:	• lung diseases • airway management • respiratory physiological phenomena • ventilators • costs • patients • biomedical research • medical equipment

Risk Stratification of Hospitalized COVID-19 Patients Through Comparative Studies of Laboratory Results with Influenza		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1113002	2020-07-31	Approved for Public Release
Author:	• Mei, Yang • Weinberg, Samuel E • Zhao, Lihui • Frink, Adam • Qi, Chao • Behdad, Amir • Ji, Peng	
Corporate Author:	Northwestern University, Chicago, IL	
Descriptors:	• hospitalizations • influenza • risk analysis • virus diseases	

	• clinical laboratory techniques (medicine) • biomedical research • patients
Background: The outbreak of Coronavirus Disease 2019 (COVID-19) in December 2019 overlaps with the flu season. Methods: We compared clinical and laboratory results from 719 influenza and 973 COVID-19 patients from January to April 2020. We compiled laboratory results from the first 14 days of the hospitalized patients using parameters that are most significantly different between COVID-19 and influenza and hierarchically clustered COVID-19 patients. Findings: Compared to influenza, patients with COVID-19 exhibited a continued increase in white blood cell count, rapid decline of hemoglobin, more rapid increase in blood urea nitrogen BUN and D-dimer, and higher level of alanine transaminase, C-reactive protein, ferritin, and fibrinogen. COVID-19 patients were sub-classified into 5 clusters through a hierarchical clustering analysis. Medical records were reviewed and patients were risk stratified based on the clinical outcomes. The cluster with the highest risk showed 27-8 fatality, 94 ICU admission, 94 intubation, and 28 discharge rates compared to 0, 38, 22, and 88 in the lowest risk cluster, respectively. Patients in the highest risk cluster had leukocytosis including neutrophilia and monocytosis, severe anemia, increased red blood cell distribution width, higher BUN, creatinine, D-dimer, alkaline phosphatase, bilirubin, and troponin. Interpretation: There are significant differences in the clinical and laboratory courses between COVID-19 and influenza. Risk stratification in hospitalized COVID-19 patients using laboratory data could be useful to predict clinical outcomes and pathophysiology of these patients.	

USNS COMFORT (T-AH 20) Surgical Services Response to the COVID-19 Pandemic in New York City		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105833	2020-07-24	Approved for Public Release
Author:	• Worlton, Tamara • Uber, Ian • Bronaugh, Stephen • Liedtke, Eric • Dougherty, Joseph • Pinkos, Kevis • Weimerskirch, Brian • Johnson, Mark	
Corporate Author:	Uniformed Services University of the Health Sciences, Bethesda, MD	
Descriptors:	• personal protective equipment • general surgery • patient care management • ships • medical personnel	

	• intensive care units • humanitarian assistance • New York

USNS COMFORT deployment New York City. The U.S. Navy Medicine response to the COVID-19 pandemic is the first time a hospital ship has been deployed to address an infectious disease outbreak. The hospital ships, USNS COMFORT T-AH 20 and USNS MERCY T-AH 19, were primarily designed as trauma platforms but have been deployed frequently and successfully for global humanitarian assistance and disaster response. The USNS COMFORT T-AH20 was activated from a maintenance period and in less than 7 days arrived in New York City NYC on March 30, 2020. The USNS COMFORT T-AH 20 is a converted oil tanker. She is 894 feet long and the flight deck sits 75 feet above the waterline. The hospital ship has twelve operating rooms including 1 interventional radiology suite, a blood bank, pharmacy, and a central sterile processing department. The radiology department has four x-ray rooms and a computed tomography scanner. Within the 1000 bed capability of the hospital ship, 80 are configured for critical care. Eleven of these intensive care unit ICU beds are isolated in a negative pressure room. The remaining ICU beds are split into open bays with 20 to 23 in each ICU. The remaining beds are in 8 open bay wards that hold 110 to 120 patients in a bunk bed configuration and are ideal for what military triage would term walking wounded.

Initial Emergency Department Mechanical Ventilation Strategies for COVID-19 Hypoxemic Respiratory Failure and ARDs

Accession Number:	Report Date:	Access Restrictions:
AD1113004	2020-06-29	Approved for Public Release

Author:	• Lentz, Skyler • Roginski, Matthew A. • Montrief, Tim • Ramzy, Mark • Gottlieb, Michael • Long, Brit
Corporate Author:	Vermont University, Burlington, VT
Descriptors:	• respiratory physiological phenomena • cardiovascular physiological phenomena • oxygenation • lung diseases • neuromuscular agents • emergency medicine • patient care

Introduction Severe acute respiratory syndrome coronavirus 2 SARS-CoV-2 is an emerging viral pathogen that causes the novel coronavirus disease of 2019 (COVID-19) and may result in hypoxemic respiratory failure necessitating invasive mechanical ventilation in the most severe cases. Objective: This narrative review provides evidence-based recommendations for

the treatment of COVID-19 related respiratory failure requiring invasive mechanical ventilation. Discussion In severe cases, COVID-19 leads to hypoxemic respiratory failure that may meet criteria for acute respiratory distress syndrome ARDS. The mainstay of treatment for ARDS includes a lung protective ventilation strategy with low tidal volumes 48 mLkg predicted body weight, adequate positive end-expiratory pressure PEEP, and maintaining a plateau pressure of 30 cm H2O. While further COVID-19 specific studies are needed, current management should focus on supportive care, preventing further lung injury from mechanical ventilation, and treating the underlying cause. Conclusions This review provides evidence-based recommendations for the treatment of COVID-19 related respiratory failure requiring invasive mechanical ventilation.

Sentinel Case of COVID-19 at Fort Stewart, GA in a National Guard Soldier Participating in Annual Training: A Case Report		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104730	2020-06-22	Approved for Public Release
Author:	• Kline, Jonathan D. • Donovan, Andrew E.	
Corporate Author:	Winn Army Community Hospital, Hinesville, GA	
Descriptors:	• military medicine • infectious diseases • military personnel • therapy • case studies • emergency medicine • military hospitals • quarantine • public health • virus diseases • epidemiology	

For healthcare providers, specifically military and federal public health personnel, prompt and accurate diagnosis and isolation of SARS-CoV-2 novel coronavirus patients provide a two-fold benefit: 1) directing appropriate treatment to the infected patient as early as possible in the progression of the disease to increase survival rates and minimize the devastating sequelae following recovery and remission of symptoms, 2) provide critical information requirements that enable commanders and public health officials to best synchronize policy, regulations, and troop movement restrictions while best allocating scarce resources in the delicate balance of risk mitigation versus mission readiness. Simple personal protective measures and robust testing and quarantine procedures, instituted and enforced aggressively by senior leaders, physicians, and healthcare professionals at all levels are an essential aspect of the battle against the COVID-19 pandemic that will determine the success or failure of the overall effort. As consideration, the authors respectfully submit this vignette of the first

confirmed positive COVID-19 case presenting to the Emergency Department at Winn Army Community Hospital, Fort Stewart, Georgia.

Optimizing Peripandemic Care for Veteran Major Non-Traumatic Lower Extremity Amputees: A Proposal Informed by a National Retrospective Descriptive Analysis of COVID-19 Risk Factor Prevalence		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104689	2020-06-30	Approved for Public Release
Author:	• Dittman, James M. • Tse, Wayne • Amendola, Michael F.	
Corporate Author:	Virginia Commonwealth, School of Medicine, Richmond, VA	
Descriptors:	• military medicine • hypertension • cardiovascular diseases • diabetes mellitus • amputation • cancer • amputees • veterans health • infection • legs • infectious diseases • lower limb amputees • patient care • health services • risk analysis • risk factors • prosthetics • lower limb amputations • therapy • surgical amputations	
In response to the Coronavirus 2019 (COVID-19) pandemic, vascular surgeons in the Veteran Affairs Health Care System have been undertaking only essential cases, such as advanced critical limb ischemia. Surgical risk assessment in these patients is often complex, considers all factors known to impact short- and long-term outcomes, and the additional risk that COVID-19 infection could convey in this patient population is unknown. The European Centre for Disease Prevention and Control ECDC published risk factors ECDC-RF implicated in increased COVID-19 hospitalization and case-fatality which have been further evidenced by initial reports from the United States Centers for Disease Control and Prevention. CDC reports additionally indicate that African American AA patients have incurred disparate		

infection outcomes in the United States. We set forth to survey the Veterans Affairs Surgical Quality Improvement Program VASQIP database over a nearly 20 year span to inform ongoing risk assessment with an estimation of the prevalence of ECDC-RF in our veteran critical limb ischemia population and investigate whether an increased COVID-19 comorbidity burden exists for AA veterans presenting for major non-traumatic amputation.

COVID-19 Pandemic: A Collection of Relevant Publications from Military Medicine		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104732	2020-06-02	Approved for Public Release
Author:	• Talbot, Laura A • Haffner, William H • Rice, Charles L • Rothwell, Stephen W	
Corporate Author:	Association of Military Surgeons of the United States, Gaithersburg, MD	
Descriptors:	• disease outbreaks • military medicine • public health • biological warfare • medical personnel • health services • aeromedical evacuation	
The most recent coronavirus, SARS-CoV-2 and its subsequent coronavirus disease 2019 COVID-19, has reached pandemic proportions requiring unprecedented actions. One established resource for national emergencies has been our nation's military. The Department of Defense mobilized National Guard, Reserve, and Active Duty service members to support the COVID-19 response and thereby accessed the nation's largest source for medical surge capacity. Our purpose for this commentary was to review over 80 years of publications in Military Medicine and identify a collection of relevant articles to the topic of COVID-19. These selected articles examine various aspects of infectious diseases, epidemics, and pandemics as analyzed through the lens of military medical experts. Our objective was to identify a selection of pertinent published military medical articles readily accessible with free access on the Military Medicine website.		

DoD COVID-19 Practice Management Guide: Clinical Management of COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1097348	2020-06-18	Approved for Public Release
Author:	• Matos, Renee I. • Chung, Kevin K.	
Corporate Author:	Defense Health Agency, Falls Church, VA	

Descriptors:	• infectious diseases • virus diseases • disease outbreaks • therapy • hygiene • lung diseases • cardiovascular physiological phenomena • patient care • airway management • medical personnel • health services • intubation • infection • respiratory physiological processes • respirators • respiratory signs and symptoms
Coronavirus Disease 2019 (COVID-19) is a respiratory illness caused by a novel coronavirus SARS-CoV-2. COVID-19 was first described in Wuhan, China in December 2019 and is now a global pandemic with more than five million confirmed cases worldwide. Most 80 of those affected have milder illness, 15 will be severely ill most often some degree of hypoxemic respiratory failure and 5 will require critical care interventions. Of those who are critically ill, most require early intubation and mechanical ventilation. Other complications include septic shock and multi-organ failure, including acute kidney injury and cardiac injury, in the setting of an inflammatory and prothrombotic state. Older age and comorbid conditions, including hypertension, diabetes, and coronary artery disease increase risk of death. The virus is highly contagious and spread via respiratory droplets, direct contact, and if aerosolized, airborne routes. The intent of this publication is to provide clinicians and military medical treatment facilities MTFs with best practices based on latest evidence to optimize DoD response to the current COVID-19 pandemic.	

TRANSCOM/AMC Commercial Aircraft Cabin Aerosol Dispersion Tests [Revisions]		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1118088	2020-06-01	Approved for Public Release
Author:	• Silcott, David • Kinahan, Sean • Santarpia, Joshua • Silcott, Blake • Silcott, Ryan • Silcott, Peter • Silcott, Braden • Distelhorst, Steven	

	• Herrera, Vicki • Rivera, Danielle • Crown, Kevin • Lucero, Gabriel • Bryden, Wayne • McLoughlin, Mike • Cetta, Maximilian • Accardi, Russell
Corporate Author:	Nebraska University, Omaha, NB
Descriptors:	• air supplies • flight testing • systems engineering • auxiliary power units • commercial aircraft • detection • disease outbreaks • detectors • aircrafts • infectious diseases • risk analysis • medical personnel • United States Transportation Command • transport aircraft

Just the facts: What drugs are safe and effective for COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105939	2020-05-22	Approved for Public Release
Author:	• Long, Brit • Liang, Stephen Y. • Rosenberg, Hans • Hicks, Christopher • Gottlieb, Michael	
Corporate Author:	Washington University School of Medicine, St. Louis, MO	
Descriptors:	• respiratory tract diseases • cardiovascular physiological phenomena • infection • therapy • infectious diseases • inhibitors • antimalarials	

	• anti bacterial agents • drug therapy • biomedical research
A 53-year-old male presents with cough, fever, and myalgias for 7 days. Vitals include temperature, 38.0C heart rate, 110 blood pressure, 11870mm Hg respiration rate, 28 and oxygen saturation 83 on room air. His only past medical history is hypertension. Your community is in the midst of the coronavirus disease 2019 COVID-19 pandemic. The patient is hypoxic but responds to oxygen supplementation with nasal cannula and a face mask. His chest x-ray demonstrates multifocal infiltrates. Are there any therapeutic agents currently available for COVID-19?	

Neurologic Complications of COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105848	2020-05-16	Approved for Public Release
Author:	• Bridwell, Rachel • Long, Brit • Gottlieb, Michael	
Corporate Author:	Brooke Army Medical Center, Fort Sam Houston, TX	
Descriptors:	• central nervous system • neurological manifestations • cerebrovascular disorders	
Background: Much of the focus regarding the global pandemic of coronavirus disease of 2019 COVID-19 has been on the cardiovascular, pulmonary, and hematologic complications. However, neurologic complications have arisen as an increasingly recognized area of morbidity and mortality. Objective: This brief report summarizes the neurologic complications associated with COVID-19 with an emphasis on the emergency medicine clinician. Discussion: COVID-19 has infected over 3.5 million people and killed over 240,000 people worldwide. While pulmonary complications are profound, the neurologic system is also significantly impacted, with complications including acute cerebrovascular events, encephalitis, Guillain-Barr syndrome, acute necrotizing hemorrhagic encephalopathy, and hemophagocytic lymphohistiocytosis. Additionally, patients on immunosuppressive medications for pre-existing neurologic issues are at an increased risk for complications with COVID-19 infection, and many of the currently proposed COVID-19 therapies can interact with these medications. Conclusions: When caring for COVID-19 patients, emergency medicine clinicians should be aware of the neurologic complications from COVID-19.		

TMPRSS2 and TMPRSS4 Promote SARS-CoV-2 infection of Human Small Intestinal Enterocytes		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1099338	2020-05-13	Approved for Public Release
Author:	• Zang, Ruochen • Gomez Castro, Maria F.	

	• McCune, Broc T. • Zeng, Qiru • Rothlauf, Paul W. • Sonnek, Naomi M. • Liu, Zhuoming • Brulois, Kevin F. • Wang, Xin • Greenberg, Harry B. • Diamond, Michael S. • Ciorba, Matthew A. • Whelan, Sean P. • Ding, Siyuan
Corporate Author:	Washington University, St. Louis, MO
Descriptors:	• RNA viruses • small intestine • cell physiological processes • epithelial cells • pathogenesis • colon • feces • bile
Gastrointestinal symptoms and fecal shedding of SARS-CoV-2 RNA are frequently observed in COVID-19 patients. However, it is unclear whether SARS-CoV-2 replicates in the human intestine and contributes to possible fecal-oral transmission. Here, we report productive infection of SARS-CoV-2 in ACE2 mature enterocytes in human small intestinal enteroids. Expression of two mucosa-specific serine proteases, TMPRSS2 and TMPRSS4, facilitated SARS-CoV-2 spike fusogenic activity and promoted virus entry into host cells. We also demonstrate that viruses released into the intestinal lumen were inactivated by simulated human colonic fluid, and infectious virus was not recovered from the stool specimens of COVID-19 patients. Our results highlight the intestine as a potential site of SARS-CoV-2 replication, which may contribute to local and systemic illness and overall disease progression.	

Biological and Epidemiological Trends in the Prevalence and Mortality Due to Outbreaks of Novel Coronavirus COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105963	2020-04-09	Approved for Public Release
Author:	• Meo, Sultan A. • Al-Khlaiwi, Thamir • Usmani, Adnan M. • Meo, Anusha S.	

	• Klonoff, David C. • Hoang, Thanh D.
Corporate Author:	King Saud University, Riyadh, Saudi Arabia
Descriptors:	• disease outbreaks • public health • statistical analysis • respiratory tract diseases • zoonotic diseases

The novel coronavirus Covid-19 infection outbreak has posed a major threat to the international health system and economy. This study is aimed at investigating the biological and epidemiological trends in the prevalence and mortality due to outbreaks of novel coronavirus COVID-19 infections. The data on the global outbreak of COVID-19, were obtained from World Health Organization WHO, Worldometer, Centers for Disease Control and Prevention CDC, and research institutes. The information was also recorded from research documents published in global scientific journals indexed in Pub Med and Institute of Scientific Information ISI Web of Science on the trends in the prevalence and mortality due to COVID-19 infection outbreaks. The results show rising trends in the transmission, prevalence and mortality rate due to coronavirus COVID-19. During the period of December 29, 2019 through March 31, 2020, it has infected 750,890 people worldwide, resulting in 36,405 deaths with a mortality rate of 4.84. The infections were more frequent among male gender over 60 years of age. The mean growth rate index for total number of cases from January 23 to March 31, 2020 was 1.20 and growth rate index for mortality rate was 1.12. There was a positive association between the prevalence and mortality rate R2 0.996. The novel coronavirus COVID-19 is highly contagious and has affected a large number of people worldwide. It is still spreading with mutable prevalence and mortality outbreak trends. The global health officials have taken priority measures to prevent further outbreaks of this emerging pathogen across the globe. However, the rising number of cases and mortality risk estimates are demonstrating that enhanced public health mediations, good hygienic conditions, social distancing, and movement limitations may control the COVID-19 epidemics.

Caring for Patients with Pain During the COVID-19 Pandemic: Consensus Recommendations from an International Expert Panel		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105985	2020-04-07	Approved for Public Release
Author:	• Shanthanna, H. • Strand, N. H. • Provenzano, D. A. • Lobo, C. A. • Eldabe, S. • Bhatia, A.	
Corporate Author:	Uniformed Services University of the Health Sciences, Bethesda, MD	

Descriptors:	• health services • medical personnel • pain • drug abuse • therapy • pain management • opioids • lung diseases • immune system • pharmacology • patient care • nervous system • hospitals • drug therapy
Chronic pain causes significant suffering, limitation of daily activities and reduced quality of life. Infection from COVID-19 is responsible for an ongoing pandemic that causes severe acute respiratory syndrome, leading to systemic complications and death. Led by the World Health Organization, healthcare systems across the world are engaged in limiting the spread of infection. As a result, all elective surgical procedures, outpatient procedures and patient visits, including pain management services, have been postponed or cancelled. This has affected the care of chronic pain patients. Most are elderly with multiple comorbidities, which puts them at risk of COVID-19 infection. Important considerations that need to be recognized during this pandemic for chronic pain patients include ensuring continuity of care and pain medications, especially opioids use of telemedicine maintaining biopsychosocial management use of anti-inflammatory drugs use of steroids and prioritizing necessary procedural visits. There are no guidelines to inform physicians and healthcare providers engaged in caring for patients with pain during this period of crisis. We assembled an expert panel of pain physicians, psychologists and researchers from North America and Europe to formulate recommendations to guide practice. As the COVID-19 situation continues to evolve rapidly, these recommendations are based on the best available evidence and expert opinion at this present time and may need adapting to local workplace policies.	

Recommendations From the CSO-HNS Taskforce on Performance of Tracheotomy During the COVID-19 Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105862	2020-04-27	Approved for Public Release
Author:	• Sommer, D. D. • Engels, P. T. • Weitzel, E. K. • Khalili, S. • Corsten, M. • Tewfik, M. A.	

	• Fung, K. • Cote, D. • Gupta, M. • Sne, N. • Brown, T. F. • Paul, J. • Kost, K. M. • Witterick, I. J.
Corporate Author:	Brooke Army Medical Center, Fort Sam Houston, TX
Descriptors:	• aerosols • personal protective equipment • intensive care units • tracheotomy • airway management • patient care • ventilators • general surgery • endoscopes

Introduction: The performance of tracheotomy is a common procedural request by critical care departments to the surgical services of general surgery, thoracic surgery and otolaryngology - head and neck surgery. A Canadian Society of Otolaryngology Head and Neck Surgery CSO-HNS task force was convened with multi-specialty involvement from otolaryngology-head and neck surgery, general surgery, critical care and anesthesiology to develop a set of recommendations for the performance of tracheotomies during the COVID-19 pandemic. Main body: The tracheotomy procedure is highly aerosol generating and directly exposes the entire surgical team to the viral aerosol plume and secretions, thereby increasing the risk of transmission to healthcare providers. As such, we believe extended endotracheal intubation should be the standard of care for the entire duration of ventilation in the vast majority of patients. Pre-operative COVID-19 testing is highly recommended for any nonemergent procedure. Conclusion: The set of recommendations in this document highlight the importance of avoiding tracheotomy procedures in patients who are COVID-19 positive if at all possible. Recommendations for appropriate PPE and environment are made for COVID-19 positive, negative and unknown patients requiring consideration of tracheotomy. The safety of healthcare professionals who care for ill patients and who keep critical infrastructure operating is paramount.

Smell and Taste Dysfunction in Patients With COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105866	2020-04-15	Approved for Public Release
Author:	• Xydakis, Michael S. • Dehgani-Mobaraki, Puya	

	• Holbrook, Eric H. • Geisthoff, Urban W. • Bauer, Christian • Hautefort, Charlotte • Herman, Philippe • Manley, Geoffrey T. • Lyon, Dina M. • Hopkins, Claire
Corporate Author:	United States Air Force Medical Corp, Wright-Patterson AFB, OH
Descriptors:	• olfactory nerve • otorhinolaryngology • smell • taste • patient care management • medical screening
The plural of an anecdote is not evidence, yet anecdotal international reports are accumulating from ear, nose, and throat ENT surgeons and other health-care workers on the frontlines that anosmia, with or without dysgeusia, are symptoms frequently associated with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. The American Academy of Otolaryngology Head and Neck Surgery and the British Association of Otorhinolaryngology are now recommending these symptoms be added to the list of primary screening symptoms for COVID-19.	

Special Report on Protecting Patient Health Information During the COVID-19 Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104727	2020-04-23	Approved for Public Release
Author:	Gorman, Carol N.	
Corporate Author:	Office of the Inspector General, Department of Defense, Alexandria, VA	
Descriptors:	• health services • information security • patient care • medical technicians • military hospitals • cybersecurity • military medicine • medical personnel • privacy	
On April 10, 2020, the Assistant Secretary of Defense for Health Affairs stated that military medicine is at the front lines of the national Novel Coronavirus COVID19 response, bringing unique and agile expertise and rapidly deployable resources to the fight. The Assistant Secretary also stated that the DoD and its Military Health System have mobilized doctors,		

nurses, and medical technicians from active duty and the Reserve Components to two ships and numerous expeditionary field hospitals around the country to support local health care systems. The Assistant Secretary emphasized that the DoD is diligently working to ensure that its beneficiaries have continued access to the care they need by ramping up virtual health capabilities, establishing drive up testing sites, and putting the right protection measures in place to minimize exposure risk to patients and health care workers. As the DoD continues to support the Nation in treating COVID19 cases around the world, it is imperative that personnel working in military medical treatment facilities MTFs renew their efforts to protect controlled unclassified information, including patient health information PHI and personally identifiable information PII. PHI is a subset of PII, and if obtained, can be used to steal identities and reveal the health conditions and medical diagnosis of a patient. As the Nations COVID-19 cases continue to increase and the DoD works diligently to care for the sick, the DoD must ensure that controls are in place to not only protect patients, physicians, and nurses from further spreading the virus, but also protect the sensitive and personal data collected from those individuals from unauthorized access and inadvertent disclosure.

Model Projections: Expected Timelines and Infection Impact for an Outbreak of COVID-19 on a USN Capital Ship		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1095576	AD1095576	Approved for Public Release
Author:	Dickey, Bradley F.	
Corporate Author:	CAN Analysis and Solutions, Arlington VA	
Descriptors:	• medical personnel • infectious diseases • disease outbreaks • quarantine • diseases and disorders • therapy • agent-based simulations • medical evacuation • patient care • simulations • evacuation • hospitalizations • hospitals • hygiene • infection • parasitic diseases • public health	

Insidious is an agent-based simulation model of infectious disease spread on US Navy ships, developed at PACFLT in March 2020 as a collaboration with CNA, NEPMU-6 and NMCPHC, described at the end of this document.

Caring for Patients' Mental Well Being During Coronavirus and Other Emerging Infectious Diseases: A Guide for Clinicians		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1096753	2020-03-11	Approved for Public Release
Corporate Author:	Uniformed Services University of the Health Sciences, Bethesda, MD	
Descriptors:	• public health • disease outbreaks • psychiatry • digestive system processes • therapy • virus diseases • mental health • hygiene • diseases and disorders	
As our world becomes increasingly interconnected, the potential for rapid and far-reaching spread of new infectious diseases is a growing threat. Especially in the early stages of an emerging infectious disease outbreak such as Coronavirus COVID-19, there is frequently a great deal of uncertainty about the nature of the disease, its spread, and its scope and impact. This may lead to significant and understandable emotional distress, even among those who have not been, and don't know if they will be, directly exposed to the disease. During emerging infectious disease outbreaks, both medical and mental health clinicians are likely to encounter patients who are experiencing various levels of emotional distress about the outbreak and its impact on them, their families, and their communities. Providers should acknowledge uncertainty about emerging diseases and help patients understand that there is often an emotional component to potential health concerns. In addition, providers should consider the following recommendations for promoting patient's mental well-being during emerging infectious disease outbreaks		

Just the Facts: What are the roles of oxygen escalation and noninvasive ventilation in COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105920	2020-01-01	Approved for Public Release
Author:	• Long, Brit • Liang, Stephen Y. • Hicks, Christopher • Gottlieb, Michael	

Corporate Author:	Washington University School of Medicine, St. Louis, MO
Descriptors:	• respiratory physiological phenomena • airway management • ventilation • therapy • emergency medicine • respiration • patient care • emergencies • respiratory physiological processes • intubation • hypoxia • oxygen
CLINICAL SCENARIO: A 37-year-old female presents with cough, fever, dyspnea, and myalgias for five days after recent contact with a family member with confirmed 2019 coronavirus disease COVID-19. Her vital signs include T 38.3 deg C, HR 108, BP 11870mm Hg, RR 26 breaths per minute, and oxygen saturation 67 on room air. She is not in respiratory distress currently and is protecting her airway. Her chest X-ray reveals bilateral airspace opacities. You plan to immediately intervene and address her hypoxia.	

Cytokine Release Syndrome in Severe COVID 19: Lessons From Arthritis and Cell Therapy in Cancer Patients Point to Therapy for Severe Disease		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1099334	2020-04-17	Approved for Public Release
Author:	• Moore, John B. • June, Carl H.	
Corporate Author:	Walter Reed National Military Medical Center, Bethesda, MD	
Descriptors:	• therapy • respiration disorders • cytokines • biological markers • immune system • mononuclear phagocyte system • disease outbreaks • epithelial cells • drug therapy • clinical trials • hypotension	
In December 2019, a new strain of coronavirus, severe acute respiratory syndrome-coronavirus 2 SARS-CoV-2, was recognized to have emerged in Wuhan, China. Along with SARS-CoV and Middle East respiratory syndrome-coronavirus MERS-CoV, SARS-CoV-2 is the		

third coronavirus to cause severe respiratory illness in humans, called coronavirus disease 2019 (COVID-19). This was recognized as a pandemic by the World Health Organization WHO in March 2020 and has had considerable global economic and health impacts. Although the situation is rapidly evolving, severe disease manifested by fever and pneumonia, leading to acute respiratory distress syndrome ARDS, has been described in up to 20 of COVID-19 cases. This is reminiscent of cytokine release syndrome CRS induced ARDS and secondary hemophagocytic lymphohistiocytosis sHLH observed in patients with SARS-CoV and MERS-CoV as well as in leukemia patients receiving engineered T cell therapy. Given this experience, urgently needed therapeutics based on suppressing CRS, such as tocilizumab, have entered clinical trials to treat COVID-19.

Continuing Operations

Adjusting Fire - Piloting an Online Sleep Class in a U.S. Air Force Population in Response to COVID-19 Patient Care Restrictions		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1145096	2021-08-01	Approved for Public Release
Author:	• Patience, Marc A • Estevez Burns, Rosemary • Cassidy, Daniel	
Corporate Author:	59th Medical Wing	
A 2021 report to the Congressional Armed Services Committees asserts that "sleep may be the most important biological factor that determines Service member health and combat readiness." Despite increased attention, insufficient sleep remains alarmingly prevalent among U.S. service members, as evidenced by a majority of Service members reporting they receive less sleep than needed to perform their military duties well. In 2015 over 60% of sampled service members reported getting less than 7 hours of sleep per night, 31.4% getting 5 hours or less, and nearly 50% reported subthreshold insomnia symptoms on the Pittsburgh Sleep Quality Index. Recent support for video-conferencing in behavioral sleep treatment delivery has surfaced, with one study documenting a large effect size (Cohen's d=1.37) at post treatment in Insomnia Severity Index total scores. Ongoing COVID-19 service delivery restrictions necessitate a rapid shift to virtual health solutions and illuminate barriers to the delivery of sleep interventions, while pushing large organizations to innovate at record speed to meet the challenge of this singularly unique moment in human history.		

Association Between Home County COVID-19 Incidence Rates and Positive Tests During Basic Military Training		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1145113	2021-08-01	Approved for Public Release
Author:	• Kieffer, John W. • Frankel, Dianne N. • Casey, Theresa M.	

	• Ebert, Ernest P.
Corporate Author:	59th Medical Wing
The COVID-19 pandemic has required military organizations to develop risk mitigation strategies in order to continue with mission-essential activities, which includes the training of new military recruits. The U.S. Air Force's Basic Military Training, conducted at Lackland Air Force Base, has a weekly intake of approximately 800 new trainees. An empirical strategy of having new recruits quarantine at home for 2 weeks prior to arrival at Lackland Air Force Base is reasonable. However, the extent to which this strategy mitigates the risk of importing COVID-19 into the recruit population is unknown. This study explores the risk of importing COVID-19 from areas of high transmission, compared with areas of low transmission, into a military training environment.	

The COVID-19 Pandemic in Sub-Saharan Africa: An Opportunity to Rethink Strategic Competition on the Continent		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1142457	2021-07-01	Approved for Public Release
Author:	• Shurkin, Michael • Noyes, Alexander • Adgie, Mary K	
Corporate Author:	Rand Project Air Force, Santa Monica, CA	
The spread of coronavirus disease 2019 (COVID-19) to sub-Saharan Africa in February 2020 spurred concern that the pandemic would have catastrophic consequences for many African countries and international interests on the continent. In March 2020, the Financial Times ran a headline that warned, Africa Faces a Catastrophe to Dwarf All Others. In early April, Le Monde reported that a study by Frances foreign ministry warned that the pandemic would be one crisis too many and could pitch several African countries over the edge.		

The Financial Impact of Corona Virus Disease 19 on Department of Defense Telework Capability		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1156160	2021-06-26	Approved for Public Release
Author:	McGarvey, Michael P.	
Corporate Author:	Defense Acquisition University	
The research presented in the paper evaluates the financial impact of Corona Virus Disease 19 on the Department of Defense Telework System. According to a survey and interviews with DoD officials, the Department of Defense Inspector General DoDIG Defense, 2021, initial challenges occurred because components had not tested their information systems and network access. However, testing was a requirement of the DoD Implementation Plan and DoD Telework Policy. As a result, some components were unprepared given the limitations of their networks and communications, and equipment. In addition, the quantity of personnel		

who instantly migrated into a telework status caused significant challenges for many organizations throughout the Department of Defense.

Evaluating the Impact of COVID-19 Based Restrictions on the Sleep and Sleep Behaviors of Airmen During Technical Training		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1145111	2021-06-10	Approved for Public Release
Author:	Patience, Marc A	
Corporate Author:	59th Medical Wing	

Readiness Implications of Coronavirus Infections on U.S. Navy Ships		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148328	2021-03-01	Approved for Public Release
Author:	• Martin, Bradley • Brahmbhatt, Trupti	
Corporate Author:	Rand Corporation, Santa Monica, CA	
Descriptors:	• medical personnel • health services • naval operations • disease outbreaks • quarantine • USS Theodore Roosevelt • hygiene • aircraft carriers • military medicine • national security • public health	

In early 2020, a highly infectious respiratory disease, COVID-19, swept across the world. The disease affected nearly every aspect of human activity, specifically anything that required close contact with other people for a prolonged period. COVID-19 appeared to be most deadly for people who are older and or have comorbidities. But even among young and healthy people, it sometimes took unexpected and fatal paths. The active-duty U.S. Navy primarily comprises young and healthy people but, by its nature, requires crew members aboard its ships to be in close proximity over a period of weeks and months. Unsurprisingly, COVID-19 outbreaks have occurred on Navy ships. Although the Navy has generally refrained from releasing ship names, the most widespread and extensive outbreak was on USS Theodore Roosevelt CVN 71 beginning in March 2020, one of the earliest months of the pandemic. The outbreak occurred while the ship was deployed in the Western Pacific and required a ten-week period pier side in Guam. A subsequent investigation by the Vice Chief of Naval Operations of the chain of command actions with regard to COVID-19 onboard the ship

determined that the ineffective implementation of social distancing and premature release of sailors from quarantine were the primary causes of increased infection. This was attributed to the USS Theodore Roosevelt leadership not effectively implementing mitigation measures for the majority of their crew, allowing social gathering areas to remain open, and continuing to perform urinalysis testing for illegal substances that should have been considered nonessential during the outbreak. Additionally, the leadership prematurely released sailors from quarantine because conditions there were crowded, and they believed that the quarantine caused more sailors to become infected. The way the outbreak was handled became a major embarrassment for the Navy and raised questions about its readiness to address a public health challenge.

The Application of Strategic Leadership to the COVID 19 Pandemic and its Impact on US Military Operations		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1119255	2021-01-05	Approved for Public Release
Author:	Maddry, Joseph K	
Corporate Author:	59 MDW, San Antonio, TX	
Descriptors:	• Afghanistan conflict • disease outbreaks • hospitals • patient care • hygiene • physicians • therapy • military hospitals • military personnel • public health • combat injuries • national security • military medicine • health services • medical personnel	

Selective AAK1 and GAK Inhibitors for Combating Dengue and other Emerging Viral Infections		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1135281	2021-01-01	Approved for Public Release
Author:	Dye, John	
Corporate Author:	Stanford University, CA	

Emerging viruses, such as dengue DENV and Ebola EBOV, pose threats to military and global health. There are no approved drugs or vaccines available against these viruses. Our goal is to develop broad-spectrum antivirals with a high genetic barrier to resistance by targeting host proteins that are critical to the life cycle of multiple viruses. The goals of this project are to optimize selective inhibitors of AAK1 and GAK, host kinases we discovered as targets for broad-spectrum antivirals, and advance their development to a pre-IND stage. This approach would also protect against multiple other biothreat agents. During the past year we have optimized the antiviral activity of two distinct series of GAK inhibitors and a series of AAK1 inhibitors, all with excellent broad- spectrum antiviral activity DENV, CHIKV and EBOV and SARS-CoV-2, including in human primary cells, with a high barrier to resistance. We have also demonstrated target modulation with representative compounds and determined key in vitro ADME parameters. We have submitted a proposal for an expansion award whose goal is to advance these improved compounds to animal studies.

An Outbreak of Covid-19 on an Aircraft Carrier		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1115097	2020-11-11	Approved for Public Release
Author:	• Kasper, Matthew R • Geibe, Jesse R • Sears, Christine L • Riegodedios, Asha J • Luse, Tina • Von Thun, Annette M • McGinnis, Michael B • Olson, Niels • Houskamp, Daniel • Fenequito, Robert • Burgess, Timothy H • Armstrong, Adam W • DeLong, Gerald • Hawkins, Robert J • Gillingham, Bruce L	
Corporate Author:	Bureau of Medicine and Surgery (Navy), Falls Church, VA	
Descriptors:	• ethnic groups • hospitalizations • disease outbreaks • military medicine • aircraft carriers • hospitals • Navy	

	• hygiene • public health • quarantine • USS Theodore Roosevelt • pain • health services • medical personnel
SARS-CoV-2 spread quickly among the crew of the U.S.S. Theodore Roosevelt. Transmission was facilitated by close-quarters conditions and by asymptomatic and presymptomatic infected crew members. Nearly half of those who tested positive for the virus never had symptoms.	

AFRICA WATCH COVID-19 Edition, Volume 23		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1136662	2020-10-29	Approved for Public Release
Author:	• Bekoe, Dorina A. • Daly, Sarah • Miller, Elissa	
Corporate Author:	Institute for Defense Analyses, Alexandria VA	
COVID-19 has had a unique impact in African countries. This special edition of Africa WatchCOVID-19examines the impact of the coronavirus in Kenya, in terms of pandemic restrictions and the resilience of institutions. Also covered are the impacts of COVID-19 and Al-Sunnah Wa Jamo insurgency on the liquefied natural gas outlook in Mozambique. Finally, this issue draws lessons from West Africa's experience with Ebola to tackle COVID-19.		

Adrift: COVID-19 and the Safety of Seafarers		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1145695	2020-10-23	Approved for Public Release
Author:	• Tallis, Joshua • Overfield, Cornell • Inks, Kevin • Rosenblum, Cherie	
Corporate Author:	Center for Naval Analyses	
Seafarers--the essential workers of the global trading system--are facing significant risks. The COVID-19 pandemic has spurred a crew change crisis, in which employers have enacted strict leave policies and longer contracts, and port states have refused to allow mariners to disembark. As a result, more than 400,000 seafarers remain stuck on their ships. Since March, seafarers and advocates have raised alarms about the mental and physical burden of these long watches. But as the pandemic approaches its first anniversary, the mounting toll on mariners is stretching beyond personal exhaustion and deeper into society and the entire		

blue economy. This policy paper, based on ongoing CNA analysis, surveys the direct and indirect effects of COVID-19 on seafarers, examines the follow-on effects on society, and recommends global solutions to protect maritime workers.

Evaluation of the Biomeme Franklin Human Performance Factors		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1143390	2020-08-01	Approved for Public Release
Author:	• Rivers, Bryan A • Berk, Kimberly L • Blum, Steven M • Buckley, Patricia E	
Corporate Author:	DEVCOM CBC	
Descriptors:	• mobile phones • mobile application software • instruction manuals • motor skills • personal protective equipment • protective equipment • biosafety • scientists • distance learning	
U.S. Army Combat Capabilities Development Command Chemical Biological Center CCDC CBC scientists completed an evaluation of the human performance factors related to the execution of COVID-19 testing using the SARS-CoV-2 Test Kit including 1 ease of use, 2 workflow development and assessment, and 3 time to results and sample throughput. The assay was found to require a fairly complex laboratory in order to safely process the samples due to the need for a biosafety cabinet to contain any SARS-CoV-2 containing aerosols. The workflow required nearly 3.5 h to complete 7 extractions, set up the seven RT-PCR reactions plus the two control RT-PCR reactions, run the RT-PCR on the Biomeme Franklin thermocycler, and interpret results. Therefore, throughput was estimated at 42 samples per 24 period on a single Franklin thermocycler.		

COVID-19 Planning Dashboard and Guidance for Global Aviation Interests		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1132136	2020-07-30	Approved for Public Release
Author:	• Robinson, Michael • Liu, Sheng • Cooper, Wayne	
Corporate Author:	The MITRE Corporation	
Descriptors:	• public health	

	• air traffic • infection • wound infections • homeland security • passengers • public safety • recovery • aircrafts
The coronavirus pandemic has significantly impacted most sectors in our society. Most notably affected is the aviation sector, where domestic and international air traffic has ground to a halt. In the U.S., passenger traffic demand decreased by 96 at the height of the pandemic. Across the globe, COVID-19 infections in nearly all countries have similarly reduced international and global traffic demand to unprecedented levels. Due to these impacts and ongoing virus risks, aviation stakeholders supporting Air Navigation Service Providers ANSP, airport authorities, and flight operators have modified operations to minimize COVID-19 infection risk and associated disruptions while still providing needed services.	

COVID-19 Monitoring and Response for U.S. Air Force Military Basic Trainees -Texas, March-April 2020		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104769	2020-07-28	Approved for Public Release
Author:	• Marcus, Joseph E. • Frankel, Dianne N. • Pawlak, Mary T. • Casey, Theresa M. • Blackwell, Rebecca S. • Tran, Francis V. • Dolan, Mathew J. • Yun, Heather C.	
Corporate Author:	59th Medical Wing, San Antonio, TX	
Descriptors:	• public health practice • military training • infectious disease transmission	
COVID-19 has had significant risk of spread in settings involving congregate living and training, yet certain essential functions need to continue despite these risks. This report shows the nonpharmaceutical interventions NPI used to limit transmission amongst the 10,579 basic trainees at Joint Base San Antonio-Lackland during the COVID-19 pandemic to 5 positive cases 47 per 100,000.		

Special Edition: Response to COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104710	2020-07-01	Approved for Public Release
Author:	• Naik, Rajesh • Livada, Alan • Zbylut, Michelle I. • Geiss, Kevin • Lane, Jason C.	
Corporate Author:	Human Systems Community of Interest (HS COI)	
Descriptors:	• military research • health services • human systems integration • human factors engineering • data analysis	
Vision: Develop and deliver technologies to enable, sustain, enhance and quantify human performance for measurably improved mission effectiveness Mission: Enhance mission effectiveness through 1) Integrated simulations for mission training and experimentation, 2) Human-machine designs for mission effectiveness, 3) Assessment of operator effectiveness, 4) Operating through battlespace stresses, and 5) Mastering the PMESII battle space. Key Products Integrated service roadmaps CoI taxonomy, budget and programs seedling and tri-service ARAP proposals, collaboration opportunities and success stories.		

Emerging Infectious Disease Diagnostic via Novel Optoelectronic Halo Effect		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104173	2020-05-01	Approved for Public Release
Author:	Naughton, Michael J.	
Corporate Author:	Boston College, Chestnut Hill, MA	
Descriptors:	• quantum dots • biosensors • genetic markers • bioassay • plasmonic • military personnel • photolithography • finite element analysis	
Forward deployed military units have a critical need for a robust, low cost, easy to use diagnostic system providing real time, quantitative, and multiplex capability of identifying biomarkers for infectious disease, including tuberculosis. This is a project to develop a new		

diagnostic device for detection of a tuberculosis biomarker based on a novel plasmonic halo effect. Various halo nanodevices using a set of chosen metals and dielectrics were simulated and fabricated, and their plasmonicoptical response sensitivity characterized. A major new finding is that a modified structure has been investigated and shows promise for response in the near infrared, and the architecture may be amenable to rapid detection of viruses.

COVID-19 and the Ethics of Military Readiness		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104702	2020-04-30	Approved for Public Release
Author:	Pfaff, C. A.	
Corporate Author:	Army War College, Carlisle Barracks, PA	
Descriptors:	• aircraft carriers • air power • aircrafts • military personnel • military operations • North Korea • active duty • Air Force • Navy • USS Theodore Roosevelt • accidents • deterrence • military training • national security • peacetime	

As is well known, then acting Secretary of the Navy Thomas Modly fired Captain Brett Crozier, captain of the aircraft carrier USS Theodore Roosevelt, after he wrote a letter arguing that all but ten percent of the crew should disembark the ship to prevent the spread of the COVID-19 virus. Doing so, he acknowledged, would diminish the carrier's readiness and slow its response time in a crisis. Justifying that decision, however, he argued, we are not at war. Sailors do not need to die. If we do not act now, we are failing to properly take care of our most trusted asset our Sailors. 1) The problem for the captain, of course, was not the content of the letter as much as it was the subsequent leak to the San Francisco Chronicle. Setting aside the fiasco that resulted in his firing, and led to Modly's sudden resignation, 2) the captain raises some important concerns regarding what the risks sailors, soldiers, airmen, and marines 3) should be required to take in peacetime. Because it is peacetime, he argues, We cannot allow a single Sailor to perish as a result of this pandemic unnecessarily. 4) Of course, even in war no one should die unnecessarily however, the captain raises a good question

what risks are necessary in peacetime. To answer that question it is first important to understand what risks are necessary in wartime.

Discovery and Synthesis of GS-5734, a Phosphoramidate Prodrug of a Pyrrolo[2,1 f][triazin-4-amino] Adenine C-Nucleoside for the Treatment of Ebola and Emerging Viruses		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1031184	2017-01-26	Approved for Public Release
Author:	• Mackman, Richard L • Siegel, Dustin • Hui, Hon C. • Doerffler, Edward • Clarke, Michael O. • Chun, Kwon • Zhang, Lijun • Neville, Sean • Carra, Ernest • Lew, Willard • Ross, Bruce • Wang, Queenie • Wolfe, Lydia • Jordan, Robert • Soloveva, Veronica • Knox, John • Perry, Jason • Perron, Michel • Stray, Kirsten M. • Baraskaus, Ona • Feng, Joy Y. • Xu, Yili • Lee, Gary • Rheingold, Arnold L. • Ray, Adrian S. • Bannister, Roy • Strickley, Robert • Swaminathan, Swami • Lee, William A. • Bavari, Sina • Cihlar, Tomas • Lo, Michael K. • Warren, Travis K.	
Corporate Author:	USAMRIID, Frederick, MD	
Descriptors:	• viral hemorrhagic fevers	

	• blood transfusions • nuclear magnetic resonance • epithelial cells • chlorides • alanine • therapeutics • chemical analysis • essential amino acids • liquid chromatography
The recent Ebola outbreak in West Africa was the largest recorded in history with over 28,000 cases confirmed in Guinea, Liberia, and Sierra Leone resulting in 11,000 deaths including 500 healthcare workers. This international crisis demonstrated the urgent need for a safe, effective and readily available treatment of Ebola infection. Multiple promising small molecule drugs and biologics were rapidly pushed into clinical trials, including several nucleoside based therapeutics.	

Coronavirus Research

Literature Review on Oral Routes of Infection for SARS-CoV-2 in Animals and Humans		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1129738	2021-04-26	Approved for Public Release
Author:	• Wood, Tess • Olinger, Gene • Lohman, Kent • Sosna, William	
Corporate Author:	MRI Global, Kansas City, MO	
Descriptors:	• health services • mers-cov • disease outbreaks • respiratory tract diseases • therapy • virus diseases • zoonoses • gastrointestinal tract • hygiene • intestines • ribonucleic acids • small intestine • bodily secretions	
In this review, we will present some aspects of the role of oral-fecal and oralingestion routes of infection and the associated morbidity and mortality with SARS-CoV-2 in animal models		

and evaluate these models as potential systems for study of the oral route of infection for this virus.

InfoForager: Leveraging Semantic Search with AMR for COVID-19 Research		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1118797	2020-12-13	Approved for Public Release
Author:	• Bonial, Claire • Lukin, Stephanie M • Doughty, David C • Hill, Steven C • Voss, Clare R	
Corporate Author:	Army Research Lab, Aberdeen Proving Ground, MD	
Descriptors:	• artificial intelligence • biological sciences • diseases and disorders • microbiology • artificial intelligence software • disease outbreaks • computational science • neural networks • computational linguistics • health services • natural language processing	
This paper examines how Abstract Meaning Representation (AMR) can be utilized for finding answers to research questions in medical scientific documents, in particular, to advance the study of UV (ultraviolet) inactivation of the novel coronavirus that causes the disease COVID-19. We describe the development of a proof-of-concept prototype tool, InfoForager, which uses AMR to conduct a semantic search, targeting the meaning of the user question, and matching this to sentences in medical documents that may contain information to answer that question. This work was conducted as a sprint over a period of six weeks, and reveals both promising results and challenges in reducing the user search time relating to COVID-19 research, and in general, domain adaption of AMR for this task.		

Whole-genome Sequencing of SARS CoV 2: Using Phylogeny and Structural Modeling to Contextualize Local Viral Evolution		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1116308	2020-11-30	Approved for Public Release
Author:	• Nazario-Toole, Ashley E. • Xia, Hui • Gibbons, Thomas F.	

Corporate Author:	59th Medical Wing, San Antonio, TX
Descriptors:	• vaccines • genomes • military medicine • military personnel • public health • biomedical research

The outbreak of SARS-CoV-2 has created a global pandemic resulting in over 1 million deaths worldwide. Rapid estimations of transmission and mutational patterns of virus outbreaks can be accomplished using whole genome viral sequencing. Here we report the development of a local pipeline for molecular epidemiological surveillance enabling DoD public health officials to track viral evolution and outbreaks. Sequencing of clinical specimens revealed that by June 2020, SAR-CoV-2 strains carrying the 614G mutation were the predominant cause of COVID-19 infections at JBSALackland. Furthermore, we identified and mapped six additional spike protein amino acid changes, information which could potentially aid vaccine design. The sequencing and phylogenetic workflow described in this paper will enable local officials to track and better understand virus transmission events. Overall, this work could improve long-term readiness efforts by providing a mechanism for analyzing the current SARS-CoV-2 pandemic as well as future disease outbreaks.

Temperature and Humidity Effects on SARS-CoV-2 and Related Coronaviruses		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1108916	2020-05-11	Approved for Public Release
Author:	• Butkus, Claire • Veigl, Alena	
Corporate Author:	UES, Dayton, OH; Air Force Research Lab, Wright-Patterson AFB, OH	
Descriptors:	• health services • respiratory tract diseases • equine encephalitis • Air Force • high temperature • low humidity • low temperature • culture techniques • environment • half life • stainless steel • biological sciences • encephalitis • humidity • statistical analysis	

In all studies investigating temperature and humidity effects on COVID-19 and related coronaviruses, low air temperature AT and low relative humidity RH favored the survival of both SARS-CoV-2 and related coronaviruses however, inactivation was more rapid at increasing RH levels and at high AT 1-8. In each case, high temperature at high RH were found to have a synergistic effect on the inactivation of coronavirus viability while lower temperatures and low relative humidity support prolonged survival of viruses on contaminated surfaces 3. The results of these studies suggest that RH has a greater effect on viral stability in activation that AT 2.

Alternatives to Viral Transport Medium for Use in SARS-CoV-2 Sample Preparation		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1110662	2020-04-17	Approved for Public Release
Author:	• Starr, Clarise • Chapleau, Richard • Rhode, Michael • Lisanby, Mark • Salisbury, Richard	
Corporate Author:	School of Aerospace Medicine, Wright-Patterson AFB, OH	
The COVID-19 outbreak has severely impacted laboratory supply chains for all materials required for testing. This supply chain concern has begun to impact the reagents needed for sample collection and transport. In a news article released by National Public Radio, the apparent decrease in new tests seen by contract laboratories like Labcorp and Quest can partially be attributed to a limited supply of VTM. To address this gap in sample transport supplies before it becomes a critical point within the MHS, GEIS requested USAFSAMPHT perform a bridge study to evaluate the performance of saline and RNAlater as alternative transport media. We performed a six-point dilution series over three days and a freeze-thaw cycle to determine the performance the CDC SARS-CoV-2assay in samples near the limit of detection prepared in RNAlater or buffered saline. Our results indicate that samples prepared in buffered saline and frozen encounter no reduction in assay sensitivity or increase in variability, but even after only 24 hours of refrigeration the saline samples begin to degrade. In contrast, RNAlater successfully stabilized refrigerated samples with no change in performance over 72 hours of refrigeration, but freezing RNAlater-stabilized samples resulted in decreased assay performance for concentrations near the lower limit of detection. We recommend advising GEIS partner network and MHS clinical labs to collect NPOP swabs in RNAlater or buffered saline and for sample transport on dry ice to USAFSAM and updating EUA submissions with reference to this bridge study demonstrating suitability of RNAlater and saline as alternative sample collection and transport materials.		

Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1094854	2020-03-17	Approved for Public Release

Author:	• Van Doremalen, Neeltje • Bushmaker, Trenton • Morris, Dylan H. • Holbrook, Myndi G. • Gamble, Amandine • Williamson, Brandi N. • Tamin, Azaibi • Harcourt, Jennifer L. • Thornburg, Natalie J. • Gerber, Susan I. • Lloyd-Smith, James O. • De Wit, Emmie • Munster, Vincent J.
Corporate Author:	National Institute of Allergy and Infectious Diseases, Hamilton, MT
Descriptors:	• diseases and disorders • disease outbreaks • respiratory tract diseases • environment • aerosols • surfaces • stainless steel • microorganisms
A novel human coronavirus that is now named severe acute respiratory syndrome coronavirus 2 SARS-CoV-2 formerly called HCoV-19 emerged in Wuhan, China, in late 2019 and is now causing a pandemic.1 We analyzed the aerosol and surface stability of SARS-CoV-2 and compared it with SARS-CoV-1, the most closely related human coronavirus.2We evaluated the stability of SARS-CoV-2 and SARS-CoV-1 in aerosols and on various surfaces and estimated their decay rates using a Bayesian regression model see the Methods section in the Supplementary Appendix, available with the full text of this letter at NEJM.org. SARS-CoV-2nCoV-WA1-2020 MN985325. and SARS-CoV-1Tor2 AY274119.3 were the strains used. Aerosols5 micron containing SARS-CoV-2 105.25 50tissue-culture infectious dose TCID50 per milliliteror SARS-CoV-1 106.75-7.00 TCID50 per milliliter were generated with the use of a three-jet Collison nebulizer and fed into a Goldberg drum to create an aerosolized environment. The inoculum resulted in cycle-threshold values between20 and 22, similar to those observed in samples obtained from the upper and lower respiratory tract in humans.	

Interferon-Beta 1a and SARS Coronavirus Replication		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA426745	2004-02-01	Approved for Public Release
Author:	• Hensley, Lisa E . • Fritz, Elizabeth A.	

	• Jahrling, Peter B. • Karp, Christopher L. • Huggins, John W.
Corporate Author:	Children's Hospital, Cincinnati, OH
Descriptors:	• signs and symptoms • respiratory system • in vitro analysis • antiviral drugs
A global outbreak of severe acute respiratory syndrome SARS caused by a novel coronavirus began in March 2003. The rapid emergence of SARS and the substantial illness and death it caused have made it a critical public health issue. Because no effective treatments are available, an intensive effort is under way to identify and test promising antiviral drugs. Here, we report that recombinant human interferon-beta 1a potently inhibits SARS coronavirus replication in vitro.	

Interactions of Rodent Coronaviruses with Cellular Receptors		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1011100	2016-05-08	Approved for Public Release
Author:	Gagneten, Sara E.	
Corporate Author:	Uniformed Services University of The Health Sciences, Bethesda, MD	
Descriptors:	• cells (biology) • receptor sites (physiology) • rats • glycoproteins • cell physiological processes • ribonucleic acids • assaying	
Coronaviruses express a spike glycoprotein S on the viral envelope and a subset of coronaviruses expresses an additional glycoprotein HE, that binds to a sugar moiety and has hemagglutinating and acetylesterase activities. This dissertation focuses on how interactions of these membrane glycoproteins with cell surface molecules affects virus species specificity and tissue tropism. To study the role of the HE glycoprotein in MHV infection we used the anti-receptor MAD-eel to block binding of S to its receptor on various mouse cell lines and then challenged these cells with an HE expressing strain of MEV to determine whether this virus could use the HE alone to initiate viral infection. When the S glycoprotein was prevented from binding to its receptor by MAb-CCl an MEV strain expressing, HE could not infect mouse fibroblast cell lines or primary brain cells. Although murine coronavirus MHV and rat coronavirus both cause common infections in colonies of laboratory rodents and are related antigenically, each virus is restricted to a single host species and the target organs for the mouse and rat viruses are different. A solid phase virus-binding assay was used to investigate the tissue specificity of binding of rat coronavirus. Rat coronavirus bound to		

membranes isolated from rat parotid and lacrimal glands, correlating well with the natural target tissues of this virus. Both rat coronavirus and MHV can infect the same murine cell line. The hypothesis that rat homologs of the MHV receptor MHVR serve as receptors for rat coronavirus was tested. Antibodies to the MHV receptor that protected these cells against MHV infection, did not protect them against infection with rat coronavirus suggesting that the rat virus does not use MHVR to infect these cells. Rat ecto-ATPase, a glycoprotein homologous to MHVR was expressed in nonpermissive hamster cells, but the cells remained resistant to infection with rat coronavirus.

Anticipating Viral Species Jumps: Bioinformatics and Data Needs		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA555216	2011-06-01	Approved for Public Release
Author:	• Flanagan, Meg L. • Leighton, Terrance J. • Dudley, Joseph P.	
Corporate Author:	Pennsylvania State University, State College, PA	
Descriptors:	• animals • biomedical information systems	

Viral species jumps also called host jumps occur when a virus acquires the ability to infect and spread among individuals of a new host species. Historical examples of animal viruses that jumped into human hosts include HIV, SARS coronavirus and influenza virus. Globally, these viruses have exacted high socioeconomic and health costs. The ability to predict viral species jumps can reduce such costs by enabling swifter outbreak mitigation strategies and prevention of initial or secondary human infection. Currently, most emerging infectious disease surveillance efforts seek the ecological drivers behind spillover events - factors like climate, land use and population migrations driving infections that do not spread between humans. By contrast, we focus here on the evolutionary drivers behind species jumps - the genetic changes over time driving infections that spread efficiently among humans. We see an opportunity to apply field surveillance and laboratory data to better understand how viral species jumps occur. There are publicly available extant data that can be marshaled. To build a mechanistic framework of understanding, data must be integrated and accessible to users for analysis and modeling, as well as formulation and testing of hypotheses. In short, bioinformatics must be applied. To that end, the Defense Threat Reduction Agency's Advanced Systems and Concepts Office hosted a workshop that gathered computational biologists and information scientists to explore the types of data needed, the computational methods required, and suitable platforms to share information among interdisciplinary stakeholders.

Distinct Patterns of IFITM-Mediated Restriction of Filoviruses, SARS Coronavirus, and Influenza A Virus		
Accession Number:	**Report Date:**	**Access Restrictions:**

ADA538594	2011-01-06	Approved for Public Release
Author:	• Huang, I.-C. • Bailey, Charles C. • Weyer, Jessica L. • Radoshitzky, Sheli R. • Becker, Michelle M. • Chiang, Jessica J. • Brass, Abraham L. • Ahmed, Asim A. • Chi, Xiaoli • Dong, Lian	
Corporate Author:	Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD	
Descriptors:	• ebola virus • hemorrhagic fevers • trypsin • sense organs • influenza • acids • proteins • cells (biology)	

Interferon-inducible transmembrane proteins 1, 2, and 3 IFITM1, 2, and 3 are recently identified viral restriction factors that inhibit infection mediated by the influenza A virus IAV hemagglutinin HA protein. Here we show that IFITM proteins restricted infection mediated by the entry glycoproteins GP1,2 of Marburg and Ebola filoviruses MARV, EBOV. Consistent with these observations, interferon-b specifically restricted filovirus and IAV entry processes. IFITM proteins also inhibited replication of infectious MARV and EBOV. We observed distinct patterns of IFITM-mediated restriction compared with IAV, the entry processes of MARV and EBOV were less restricted by IFITM3, but more restricted by IFITM1. Moreover, murine Ifitm5 and 6 did not restrict IAV, but efficiently inhibited filovirus entry. We further demonstrate that replication of infectious SARS coronavirus SARS-CoV and entry mediated by the SARS-CoV spike S protein are restricted by IFITM proteins. The profile of IFITM-mediated restriction of SARS-CoV was more similar to that of filoviruses than to IAV. Trypsin treatment of receptor-associated SARS-CoV pseudovirions, which bypasses their dependence on lysosomal cathepsin L, also bypassed IFITM-mediated restriction. However, IFITM proteins did not reduce cellular cathepsin activity or limit access of virions to acidic intracellular compartments. Our data indicate that IFITM-mediated restriction is localized to a late stage in the endocytic pathway. They further show that IFITM proteins differentially restrict the entry of a broad range of enveloped viruses, and modulate cellular tropism independently of viral receptor expression.

Decontamination

ESP-DLux - Automated Germicidal Light Infection Control/Biosecurity System		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151130	2021-09-15	Approved for Public Release
Author:	Dugal, AJ	
Corporate Author:	Central Command, Macdill AFB, FL	
Descriptors:	• infection control • health services • disinfection • rapid deployment • biological weapons • force protection • diseases and disorders • hygiene • pathogenic bacteria	
Breakthrough exosome technology that enables new ways to diagnose and treat diseases and exposures such as cancer, infection and brain injury.		

Quantitative Efficacy of Common Virucidal Disinfectants Against Viral Surrogates on Porous and Nonporous Surfaces		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1140208	2021-07-01	Approved for Public Release
Author:	• Rastogi, Vipin K. • Wallace, Lalena • Hurst, Savannah	
Corporate Author:	Chemical Biological Center, Aberdeen Proving Ground, MD	
The objectives of this effort were threefold a compare Ebola virus EBOV with a potential surrogate, the enveloped vaccinia virus VACV, for susceptibility to disinfectants b generate efficacy data for five U.S. Environmental Protection Agency-registered virucidal chemicals and one experimental disinfectant, 5 percent vinegar, against VACV and c compare the efficacy of three chemicals against Phi 6 a bacteriophage surrogate for EBOV and VACV. The Organization for Economic Co-operation and Development OECD method was adopted for efficacy evaluations. Of the three test viruses, VACV was found be the most persistent virus. Of six disinfectants, Peridox disinfectant Contec Spartanburg, SC was most effective against all three viruses. Bioxy-S sanitizer Atomes, Inc. Quebec, Canada was effective against all three viruses. The other four disinfectants were not very effective against VACV. Peridox disinfectant, 0.2 percent peracetic acid PAA, and 0.5 percent bleach were effective against Phi 6 in the absence of blood. In the presence of blood dried and wet, both Peridox disinfectant and PAA were equally effective against Phi 6. VACV is recommended as a potential surrogate for EBOV. More importantly, this study highlights that the DoD must		

generate its own database on efficacy of disinfectants for military surfaces to select effective chemicals in the event of a pandemic resulting from an infectious virus.

InfoForager: Leveraging Semantic Search with AMR for COVID-19 Research		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1118797	2020-12-13	Approved for Public Release
Author:	• Bonial, Claire • Lukin, Stephanie M • Doughty, David C • Hill, Steven C • Voss, Clare R	
Corporate Author:	Army Research Laboratory, Aberdeen Proving Ground, MD	
Descriptors:	• artificial intelligence • biological sciences • diseases and disorders • microbiology • artificial intelligence software • disease outbreaks • computational science • neural networks • computational linguistics • health services • virus diseases • natural language processing	

Use of Ultraviolet Germicidal Irradiation (UVGI) for COVID-19 Decontamination Purposes		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1110390	2020-05-03	Approved for Public Release
Author:	• Hope, Janiece • Harrington, Lawrence	
Corporate Author:	711 Human Performance Wing, Wright-Patterson AFB, OH	
Descriptors:	• decontamination • respiratory tract diseases • respirators • disinfection • biomedical research	
This document was crafted in response to multiple inquiries regarding the use of Ultraviolet Germicidal Irradiation UVGI for decontamination and includes general information on the use of UVGI. More specifically, this document includes detailed responses for two specific areas		

of concern that have been of interest in the DoD, decontamination and reuse of filtering facepiece respirators and the use of UVGI to disinfect an occupied space.

N95 Filtering Facepiece Respirator Ultraviolet Germicidal Irradiation (UVGI) Process for Decontamination and Reuse		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1094346	2020-01-01	Approved for Public Release
Author:	• Lowe, John J. • Paladino, Katie D. • Farke, Jerald D. • Boulter, Kathleen • Cawcutt, Kelly • Emodi, Mark • Gibbs, Shawn • Hankins, Richard • Hinkle, Lauren • Micheels, Terry • Schwedhelm, Shelly • Vasa, Angela • Wadman, Michael • Watson, Suzanne • Rupp, Mark E.	
Corporate Author:	University of Nebraska Medical Center	
Descriptors:	• medical personnel • hygiene • filtration • industrial hygiene • virus diseases • decontamination • disease outbreaks • respirators • RNA Viruses • scientific literature • light sources	
The ongoing pandemic of SARS-CoV-2 resulting in COVID-19 has severely stressed the worldwide healthcare system and has created dangerous shortages of personal protective equipment PPE including N95 filtering facepiece respirators N95 FFRs. In an effort to extend the stockpile of N95 FFRs at our institution and reduce risks associated with reuse of untreated, contaminated N95 FFRs, we developed a surface decontamination procedure involving the delivery of ultraviolet germicidal irradiation UVGI to used N95 FFRs. The evidence base supporting this program includes 1) UVGI has been shown to effectively		

inactivate a wide range of human pathogens including coronaviruses and other human respiratory viruses 2) UVGI has been demonstrated to inactivate human respiratory viruses, including coronaviruses, on various models of N95 FFRs 3) levels of UVGI needed to inactive human respiratory viruses are well below the level of irradiation that adversely affects the fit and filtration characteristics of N95 FFRs and 4) UVGI can be safely administered when appropriate safeguards are in place. We also recognize there is uncertainty regarding how long an N95 FFR maintains properties to achieve adequate fit, requiring providers to inspect FFRs before and after reuse. Any organization considering a decontamination strategy including UVGI, vaporized hydrogen peroxide, warm moist heat, etc. to deal with lack of supply or potential lack of N95 FFR should validate their own procedures, including desired surrogate microbial reduction and retained filter efficiency and fit. Herein, we briefly describe our procedure to surface decontaminate and reuse N95 FFRs.

Defense Production Act

New COVID-19 Defense Production Act (DPA) Actions: Implementation Considerations		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148943	2021-03-01	Approved for Public Release
Author:	• Cecire, Michael H. • Peters, Heidi M. • Hart, Nina M.	
Corporate Author:	Library of Congress, Washington, DC	
Descriptors:	• law • national security • supply chain • public health • government procurement • governments • military acquisition • production • supreme court	
The Biden Administration has taken several executive branch actions under the Defense Production Act of1950 DPA to address the Coronavirus Disease 2019 COVID-19 pandemic. Those actions suggest a revised DPA approach and raise potential implementation issues. This Insight considers those issues and policy considerations for Congress. It is intended as a companion to CRS Insight IN11593. See CRS Report R43767 for a discussion of DPA history and authorities.		

COVID-19: Defense Production Act (DPA) Developments and Issues for Congress		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1146642	2020-05-15	Approved for Public Release

Author:	• Cecire, Michael H • Peters, Heidi M
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC
The White House is employing the Defense Production Act of 1950 (DPA) in response to the Coronavirus Disease 2019 (COVID-19) pandemic to facilitate the production and availability of essential goods, supplies, and services. This Insight considers recent DPA actions and associated policy considerations for Congress. It is a companion to CRS Insights IN11337, IN11280, and IN11231. See CRS Report R43767 for a more in-depth discussion of DPA history and authorities.	

COVID-19: Industrial Mobilization and Defense Production Act (DPA) Implementation		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1099590	2020-03-25	Approved for Public Release
Author:	• Cecire, Michael H. • Peters, Heidi M.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington, DC	
Descriptors:	• acquisition • emergencies • medical equipment and supplies • government procurement • military acquisition • mobilization • industrial mobilization • national security	
On March 18, President Trump issued Executive Order 13909, Prioritizing and Allocating Health and Medical Resources to Respond to the Spread of COVID19, which announced the Presidents invocation of the Defense Production Act of 1950 DPA in response to the COVID-19 pandemic. The administration has yet to publicly provide direction to the private sector under this authority. This Insight considers possible future DPA implementation processes, industrial mobilization, and congressional considerations concerning the COVID-19 pandemic, and is a companion to CRS Insight IN11231. See CRS Report R43767 for a more in-depth discussion of DPA history and authorities. For additional related resources, see the CRS Coronavirus Disease 2019 homepage.		

Defense Production Act: Purpose and Scope		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA501341	2009-05-14	Approved for Public Release
Author:	Else, Daniel H.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington, DC	
Descriptors:	• industrial production	

	• national defense • legislation • defense industry • industrial mobilization • national security • homeland security • industrial modernization • investments
The Defense Production Act DPA was created at the outset of the Korean War to ensure the availability of the nation's industrial resources to meet the national security needs of the United States by granting the President powers to ensure the supply and timely delivery of products, materials, and services to military and civilian agencies. The DPA codifies a robust legal authority given the President to force industry to give priority to national security production and is the statutory underpinning of governmental review of foreign investment in U.S. companies. DPA authorities are not permanent. Rather, they are time-limited, undergoing periodic amendment and reauthorization. Of the seven titles contained within the original Act, four have been repealed. In 2008, Congress reauthorized the remaining titles of the DPA through September 30, 2009.	

DEFENSE PRODUCTION ACT: Agencies Lack Policies and Guidance for Use of Key Authorities		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA483250	2008-06-01	Approved for Public Release
Corporate Author:	Government Accountability Office, Washington, DC	
Descriptors:	• national defense • contracts • allocations • emergencies • resources • international trade • economic impact • production • national security • policies • industries	
Congress enacted the Defense Production Act of 1950 DPA to ensure the availability of industrial resources to meet defense needs. Amendments to the Act allow its use for energy supply, emergency preparedness, and critical infrastructure protection and require agencies to report on foreign offsets, which are incentives to foreign governments to purchase U.S. goods and services. Only Titles I, III, and VII remain in effect. In the National Defense Authorization Act for Fiscal Year 2008, Congress directed GAO to review recent agency efforts to implement the DPA. This report 1 examines the extent to which agencies use DPA		

authorities and 2 assesses agencies response to reporting requirements on the economic impact of foreign offsets. GAOs work is based on a review of policies and guidance for the use of DPA authorities, instances in which agencies have exercised the authorities, and the analysis used in required reports on foreign offsets. GAOs three recommendations are that agencies develop and implement a priorities and allocations system, consider ratings in advance of emergencies, and that Commerce update regulations to better assess the economic effect of offsets. USDA concurred, while other agencies provided only technical comments. HHS and DOT indicated that they plan to implement our recommendations.

The Defense Production Act of 1950: Vital Defense and Emergency Acquisition Authority for 2002		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA402217	2002-05-02	Approved for Public Release
Author:	Ruane, Matthew J.	
Corporate Author:	Judge Advocate General's School, Charlottesville, VA	
Descriptors:	• emergencies • acquisition • defense industry • contracts • civil affairs • industrial relations	
The September 11th attacks should inspire the government acquisition community to carefully study the Defense Production Act of 1950 to ensure that its powerful authorities over the civilian economy are judiciously and deliberately used and only very carefully revised. Generally, the DPA affords to the President an array of authorities to shape defense preparedness programs and to take appropriate steps to maintain and enhance the defense industrial and technological base. More specifically, the DPA provides two distinct types of powers One is the future oriented authority to expand and protect the United States industrial base under titles III and VII. The other is the title I authority to conscript industry to ensure the timely availability of products, materials, services, and facilities for defense preparedness and national emergency requirements.		

Credible Mobilization Crucial for the Defense of the Nation		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA527842	1990-01-01	Approved for public Release
Author:	McCammond, Rosemary L.	
Corporate Author:	Marine Corps University, Quantico, VA	
Descriptors:	• strategic materials • mobilization • warfare	

	• industries • national security • stockpiles • deterrence • military supplies • strategic warning • USSR
Although the concept of isolationism and reliance on the oceans as adequate defense dissolved with technology advances, increasing world interests, and a more unstable world, experience from the World Wars has failed to teach us the importance of maintaining adequate mobilization measures. DOD is concerned with declining industrial base, technological lead, and economic stature affecting our deterrent posture, much which is beyond the control of the Department of Defense to correct. The nation has known problems meeting surge operations--mobilization is much more extensive. U.S. has to import strategic minerals to maintain our high standard of living and to make military goods. The Soviet Union has or access to strategic materials for weapons--and the ability to deny our access. Although stockpiling is insurance for war when sea lines of communication are in jeopardy, we are near half of the stockpile goals. New Executive Order with DOD as manager and other managerial improvements and renewed interest help, but fiscal constraints will hurt.	

Government Response

Misinformation

You Can't Quarantine the Truth: Lessons Learned in Logical Fallacy Annotation of an Infodemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1156298	2022-01-01	Approved for Public Release
Author:	• Bonial, Claire • Hudson, Taylor A • Blodgett, Austin • Lukin, Stephanie M • Micher, Jeffrey • Summers-Stay, Douglas • Sutor, Peter • Voss, Clare R	
Corporate Author:	DEVCOM Army Research Laboratory, Adelphi, MD	
Given the current COVID-19 infodemic that crosses multiple genres of text, we posit that flagging potentially problematic information PPI retrieved by a semantic search system will be critical to combating mis- or disinformation. This report describes the construction of a COVID-19 corpus and a two-level annotation of logical fallacies in these documents, supplemented with inter-annotator agreement results over two development phases. We also report a preliminary assessment of the corpus for training and testing a machine learning		

algorithm Pattern-Exploiting Training for fallacy detection and recognition. The agreement results and system performance underscore the challenging nature of this annotation task. We propose targeted improvements for fallacy annotation and conclude that a practical implementation may be to report a documents overall fallacy rate as a measure of its credibility.

Digital Deception: The Cognitive and Social Mechanisms of the Spread of Fake News		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1144438	2021-07-07	Approved for Public Release
Author:	Lerman, Kristina	
Corporate Author:	University of Southern California, Los Angeles, CA	
This project investigates coupled sensor configuration and planning (CSCP) for autonomous systems, which is a mode of active control of information in context to a decision-making problem. We consider a scenario consisting of a network of mobile vehicles called sensors, and a separate network of mobile vehicles called actors. Sensors gather information about the environment whereas actors perform desired tasks. Specifically, the actors perform tasks encoded in terms of multi-vehicle route-planning problems in a threatening environment. The threat is an unknown spatiotemporally-varying scalar field that is estimated using observations made by sensors.		

Telling China's COVID-19 Story Well: Beijing's Efforts to Control Information and Shape Public Narratives Regarding the 2020 Global Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1145617	2020-12-01	Approved for Public Release
Author:	Case, Josiah	
Corporate Author:	Center for Naval Analyses	
As the world continues to battle the COVID-19 pandemic, the Chinese Communist Party CCP has striven to shape the domestic and international public narratives around the crisis. Chief among its arguments are that China rose to the challenge of the outbreak and has exemplified the role of a responsible great power. At the same time, it has attempted to deflect blame for the initial outbreak by engaging in an unprecedented disinformation campaign aimed at sowing doubt over the origin of the virus. This report reconstructs the evolution of these narratives and their supporting themes, as well as the wide range of tools and tactics that Beijing has used to influence public opinion - to include diverse public messaging platforms, foreign aid efforts, and suppression of domestic dissidents. The report also examines how Beijing has attempted to use the crisis to degrade international trust in Washington by using the US response to the pandemic as a foil against which to highlight its own successes.		

Effects of COVID-19 on the U.S. and Globe

Global Economic Effects of COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1152929	2021-11-10	Approved for Public Release
Author:	Jackson, James K.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington, DC	
Descriptors:	• health services • medical personnel • national governments • business administration • intellectual property • investments • international relations • international organizations • international trade • economic development • geographic regions • law • national security	

The COVID-19 viral pandemic is an unprecedented global phenomenon that is also a highly personal experience with wide-ranging effects. On September 20, 2021, U.S. viral deaths surpassed the 675,446 total from the 1918 Spanish flu, the previously worst U.S. pandemic related death total on record. The pandemic has disrupted lives across all countries and communities and negatively affected global economic growth in 2020 beyond anything experienced in nearly a century. Estimates indicate the virus reduced global economic growth in2020 to an annualized rate of around -3.2, with a recovery of 5.9 projected for 2021. Global trade is estimated to have fallen by 5.3 in 2020, but is projected to grow by 8.0 in 2021. According to a consensus of forecasts, the economic downturn in 2020 was not as negative as initially estimated, due in part to the fiscal and monetary policies governments adopted in 2020.In most countries, economic growth fell sharply in the second quarter of 2020, rebounded quickly in the third quarter, and has been mostly positive since. Although lessening, the total global economic effects continue to mount. In particular, the prolonged nature of the health crisis is affecting the global economy beyond traditional measures with potentially long-lasting and far-reaching repercussions. Economic forecasts reflect continuing risks to a sustained global recovery posed by a resurgence of infectious cases and potential inflationary pressures associated with pent-up consumer demand fueled by an increase in personal savings. On the supply side, shortages reflect lingering disruptions to labor markets, production and supply chain bottlenecks, disruptions in global energy markets, and shipping and transportation constraints that are adding to inflationary pressures.

Plagues and Power: The Evolutionary Influence of Disease on Great Power Competition		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151153	2021-06-01	Approved for Public Release
Author:	Slone, Travis S.	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	• health services • medical personnel • international relations • disease outbreaks • international organizations • personnel management • business administration • commerce • globalization • lepidoptera	
Disease has contributed to the reshuffling of the regional and global orders throughout history. Strangely, this variable has been neglected vis-a-vis Great Power Competition GPC, creating a plague gap in the literature on international relations and transitions of power. In general, historians and political scientists connect power shifts to military clashes, diplomacy, or economic developments. Investigating the emergence and spread of novel diseases throughout time offers a new variable to the discussion. My findings explore how disease has factored into the decline of some empires the Athenian, Roman, Byzantine, and Mongol empires and the expansion of others Spain and Great Britain. In GPC disease can be used as an instrument of conquest or as a collaborative tool of governance. Disease can weaken states abilities to compete economically and militarily with rivals. The ongoing GPC with the Peoples Republic of China PRC and the 2019 Novel Coronavirus Disease COVID-19 pandemic provides yet another example of this pattern. My research suggests the possibility that COVID-19 will accelerate Chinese superiority and reshape the international order in the PRCs favor. Consideration must be given to the inclusion of disease in determining national policy in GPC.		

The Effect of COVID-19 on Small Businesses in Greece		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151088	2021-06-01	Approved for Public Release
Author:	Mylonas, Anastasios	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	• data analysis • business administration • medical personnel • commerce • public health	

	• health services • internet of things • small business • economics

The ongoing global public health crisis has disrupted the free flow of commercial activities in every aspect of human life. The aim of this study is to explore the impact of the COVID-19 pandemic on small businesses, by focusing on a case study of Greece. Based on the interpretivist philosophy, the study adopts a qualitative approach and explores various operational and financial issues that have affected small businesses since the outbreak of the pandemic. Data was collected from a sample of three small-business managers recruited from a coffee shop, a beauty salon, and a food factory to complete a questionnaire. Findings show that the three small businesses in Greece experienced a reduction of customers and thereby revenues, despite maintaining their usual suppliers. While they experienced fluctuating operating expenses and taxes, the businesses received little or no financial support from the government during the period studied. In addition, the businesses endeavored to adhere to lockdown, curfew, and social distancing guidelines, which affected them further. Moreover, the study finds the businesses had inadequate resources for crisis management. The study recommends follow-on research use larger samples in a quantitative approach to increase the accuracy of findings.

Post-COVID-19 European Strategic Opportunities: An Inquiry into Strategic Great Power		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1154035	2021-05-28	Approved for Public Release
Author:	Crain, Bradford P.	
Corporate Author:	National Defense University, Norfolk, VA	
Descriptors:	• national security • international organizations • intergovernmental organizations • international law • international relations • investments • military science • political movements • treaties • defense industry • governments • national politics	

In the post-COVID-19 pandemic strategic environment, the virus's influence on European strategic factors of the economy, political unity, and human security indicate vulnerabilities in the European cooperative security environment. These conditions offer the Russian Federation a rare strategic opportunity. The US's predominant approach toward the Russian Federation has been to attempt to build deeper partnerships and include the federation in

the international order as an effective partner. However, the US strategic approach toward Russia has changed since that country adopted a more aggressive, opportunistic, and risky strategic approach. Additionally, because of the ubiquitous nature of the COVID-19 virus, Russia may realize it has a rare opportunity in the European strategic areas of interest to disrupt the institutions and organizations that prevent Russia from achieving its strategic objectives to erode the United States global influence.

Are We There Yet? Using the Push-Pull Theory to Address Latin American Migration to the U.S. During COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1154025	2021-05-28	Approved for Public Release
Author:	Hemphill, Johari J	
Corporate Author:	National Defense University, Norfolk, VA	
Descriptors:	• national security • Air Force • foreign relations • national politics • warfare • disease outbreaks • health services • international organizations • law • medical personnel	

For decades, the U.S. policy on immigration from Latin America has focused exclusively on preventing illegal immigration. Such a one-sided approach has exasperated the U.S. immigration situation rather than helped those in power understand and address the underlying reasons why so many are willing to take the associated risks. The inability to assess Latin American countries needs demonstrates the disconnect between policy and implementation of U.S. departments and agencies programs to increase capacity and stability. Adopting the push-pull theory as a framework for understanding why people risk their lives to immigrate to the U.S. illegally will help policymakers understand the strategic environment and enable strategists to design approaches that help the U.S., its allies and partners to mitigate the underlying problems. The study provides background on U.S. interests in Latin America due to geography, economy, and security with historical references of immigration policy across five administrations as the context and consequence of U.S. presidents over time. The Biden Administration is at an inflection point with immigration and a global health crisis. The U.S. Strategy to Prevent Conflict and Promote Stability provides the approach to assist leaders on immigration.

Africa Watch. COVID-19 Edition		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148070	2021-02-03	Approved for Public Release
Author:	• Swift, Austin • Daly, Sarah • Sindle, Erin	
Corporate Author:	Institute for Defense Analyses, Alexandria, VA	
Descriptors:	• health services • medical personnel • distance learning • public health • governments • international organizations • infectious diseases • department of homeland security • mobile phones • quarantine	
IDA's Africa team focuses on issues related to political, economic, and social stability and security on the continent. This is volume 25, the COVID-19 Edition.		

The Pandemic's Prod: Revamping America's Strategy for Rapid AI Implementation		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1152895	2021-02-02	Approved for Public Release
Author:	Nicholson, Mark A.	
Corporate Author:	Naval War College, Newport, RI	
Descriptors:	• artificial intelligence • mobile phones • national security • information systems • neural networks • federal budgets • global positioning systems • governments • human rights • machine learning • public policy	
The current pandemic has fast-tracked the implementation of Artificial Intelligence (AI) technologies and created a crisis for Americas technological leadership. But the United States can maintain its pole position in AI and reap the economic benefits if it adopts a whole-of-nation strategic approach. Forming a public-private venture permits the United States to		

create a winning strategy focused on three primary roles. First, a fiscally minded system to coordinate the governments research and development efforts with the academic and commercial sectors, maximizing and exploiting future technological leaps in AI. Second, an organized governance approach to synchronize the academic, commercial, and public segments as well as like-minded international partners, ensuring the AI policies and standards are supportive of American leadership and representative of democratic values. Third, a socially focused approach that enables municipal and commercial partnerships to provide the U.S. labor force with the essential skills that AI cannot replicate. Unfortunately, the window of opportunity is rapidly closing. Given the pace of automation and the current economic crisis, leadership must act now to adopt this strategy and ensure a prosperous future for America.

Disaster Recovery: COVID-19 Pandemic Intensifies Disaster Recovery Challenges for K-12 Schools		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1155882	2020-10-14	Approved for Public Release
Author:	Nowicki, Jacqueline M	
Corporate Author:	Government Accountability Office, Washington DC	
More than 260 presidentially-declared major disasters have occurred since 2017, affecting every state and several U.S. territories, according to the Federal Emergency Management Agency (FEMA). Many of these natural disasters have had devastating effects, including rendering K-12 school facilities unusable for extended periods of time. These schools are now experiencing the compounding challenge of recovering from these natural disasters while managing effects of the Coronavirus Disease 2019 (COVID-19). Social distancing practices and building closures are meant to keep staff and students safe, but may also complicate recovery efforts for disaster-affected districts.		

Unequal Effects of the COVID-19 Pandemic on Scientists		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1110989	2020-07-15	Approved for Public Release
Author:	• Myers, Kyle R • Tham, Wei Y • Yin, Yian • Cohodes, Nina • Thursby, Jerry G • Thursby, Marie C • Schiffer, Peter • Walsh, Joseph T • Lakhani, Karim R • Wang, Dashun	

Corporate Author:	Northwestern University, Evanston, IL
Descriptors:	• scientists • statistics
COVID-19 has not affected all scientists equally. A survey of principal investigators indicates that female scientists, those in the bench sciences and, especially, scientists with young children experienced a substantial decline in time devoted to research. This could have important short- and longer-term effects on their careers, which institution leaders and funders need to address carefully.	

PEPFAR's response to the convergence of the HIV and COVID-19 pandemics in Sub-Saharan Africa		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105917	2020-07-12	Approved for Public Release
Author:	• Golin, Rachel • Godfrey, Catherine • Firth, Jacqueline • Lee, Lana • Minior, Thomas • Phelps, B. R. • Raizes, Elliot G. • Ake, Julie A. • Siberry, George K.	
Corporate Author:	United States Agency for International Development, Washington DC	
Descriptors:	• patient care • public health • governments • health services	
The COVID-19 pandemic reached the African continent in less than three months from when the first cases were reported from mainland China. As COVID-19 preparedness and response plans were rapidly instituted across sub-Saharan Africa, many governments and donor organizations braced themselves for the unknown impact the COVID-19 pandemic would have in under-resourced settings with high burdens of PLHIV. The potential negative impact of COVID-19 in these countries is uncertain, but is estimated to contribute both directly and indirectly to the morbidity and mortality of PLHIV, requiring countries to leverage existing HIV care systems to propel COVID-19 responses, while safeguarding PLHIV and HIV programme gains. In anticipation of COVID-19-related disruptions, PEPFAR promptly established guidance to rapidly adapt HIV programmes to maintain essential HIV services while protecting recipients of care and staff from COVID-19. This commentary reviews PEPFARs COVID-19 technical guidance and provides country-specific examples of programme adaptions in sub-Saharan Africa.		

Strategic Multilayer Assessment Special Topics Paper: The COVID Crisis: Implications for United States- and Global- Biosecurity		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1097149	2020-04-22	Approved for Public Release
Author:	• Venkatram,Vikram • Giordano, James	
Corporate Author:	Georgetown University, Washington	
Descriptors:	• disease outbreaks • public health • antiviral agents • health services • immune system • antibodies • infection • medical equipment and supplies • ventilators • drug therapy	
The United States (US) engagement of public health resources to meet the current SARS-CoV-2 COVID-19 crisis has revealed vulnerabilities in testing and treatment components of biosecurity. Facing a severe shortage of available testing kits, the US Centers for Disease Control CDC attempted to develop its own test for COVID-19, rather than following World Health Organization WHO recommendations for testing methods1. The lack of tests has made it difficult to track exactly how many people within each state, as well as the US at-large have been affected, which has implications both for the extent of public health response, and considerations for approaches to stabilize and sustain the national economy.		

The Chinese Dream Has Awakened to a Global Nightmare: A Case for US-China Cooperative Security to Regain Stability in the Wake of Coronavirus		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1107337	2020-03-20	Approved for Public Release
Author:	Sutton, Edward L.	
Corporate Author:	Air Command and Staff College, Maxwell AFB, AL	
Descriptors:	• foreign policy • diseases and disorders • governments • national politics • economic development • foreign relations • international relations • public health	

	• commerce • local governments
Domestic reality in China during the reign of Xi Jinping has always been dichotomous. On one hand, most contemporary Chinese believe their lives have rapidly improved and will continue to do so. On the other hand, citizens suspect improvement comes at the cost of corruption by the insidiously repressive tiers of the Chinese Communist Party CCP--or cadre management system--and express discontent regarding asymmetries and inequities observed in development among different segments of society. The CCP is keenly aware of this tension and insecure that collective improvement--equitable or otherwise--will raise popular expectations for continued growth and development to levels difficult to sustain.	

Federal Policy, Cares Act, and Evaluations

Processing Policy in a Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151152	2021-06-01	Approved for Public Release
Author:	• Sherman, Gregory D. • Okonak, Jonathan M. • Liashek, Matthew D.	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	• health services • medical personnel • disease outbreaks • public health • business administration • quarantine • USS Theodore Roosevelt • hygiene • national security • governments	
The United States has no recent experience dealing with a large-scale pandemic such as COVID-19 that has clearly affected our entire culture, institutions, and way of life. This type of problem is not predictable, and its associated impacts are not easily estimated. As such, we conducted a quantitative comparison in terms of case count between the Navy's response and the United States national response to the COVID-19 pandemic. We evaluated the timing and implementation of Navy versus national and state policies, and explored the patterns and lessons learned to benefit the Navy and Department of Defense in the future. Our study meets a substantial need to look at both entities response from an objective standpoint and to critique those aspects that served to further benefit or hinder outcomes.		

Evaluation of Access to Department of Defense Information Technology and Communications During the Coronavirus Disease 2019 Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148720	2021-03-30	Approved for Public Release
Author:	Gorman, Carol	
Corporate Author:	Office of the Inspector General, Department of Defense, Alexandria, VA	
Descriptors:	• military science • information systems • warfare • video teleconferencing • personnel management • national security • medical personnel • communication systems • electronic mail • health services • mobile phones	
The objective of this evaluation was to determine the extent to which DoD Components provided access to DoD information technology and communications during the coronavirus disease 2019 COVID-19 pandemic.		

Audit of Contracts for DoD Information Technology Products and Services Procured by DoD Components in Response to the Coronavirus Disease-2019 Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1147970	2021-02-12	Approved for Public Release
Author:	Gorman, Carol N.	
Corporate Author:	Office of the Inspector General, Department of Defense, Alexandria, VA	
Descriptors:	• information systems • cybersecurity • procurement • computers • economic security • governments • human resources • public health • acquisition • Air Force • business administration • contracts • financial management	

	• law • market research • military medicine • national security

Objective: The objective of this audit was to determine whether DoD Components, in accordance with Public Law 116-136, Coronavirus Aid, Relief, and Economic Security Act CARES Act and other Federal and DoD requirements procured information technology products and services to support operations in response to the coronavirus disease 2019 (COVID-19) pandemic paid fair and reasonable prices for those products and services assessed whether known cybersecurity risks existed and developed risk mitigation strategies for the risks before procuring or using the information technology products and accurately reported the required COVID-19-related codes to USAspending.gov. Background: COVID-19 is an infectious disease caused by a newly discovered coronavirus. On January 31, 2020, the Secretary of Health and Human Services declared a public health emergency due to confirmed cases of COVID-19 in the United States. On March 11, 2020, the World Health Organization declared the COVID-19 outbreak a pandemic, and on March 13, 2020, the President declared the COVID-19 pandemic a national emergency as COVID-19 continued to spread across the country. On March 15, 2020, to protect the health and safety of the workforce, the Acting Director of the Office of Management and Budget issued a memorandum asking all Federal Executive Branch departments and agencies to offer maximum telework flexibilities to all eligible personnel. Two days later, on March 17, 2020, the Office of Management and Budget issued a memorandum directing agencies to begin implementing policies and procedures to safeguard the health and safety of Federal workplaces, including maximizing telework across the Nation for the Federal workforce, while ensuring that Government operations continue.

COVID-19: Key Insights from GAO's Oversight of the Federal Public Health Response		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1147990	2021-02-24	Approved for Public Release
Author:	Clowers, A N	
Corporate Author:	Government Accountability Office, Washington DC	
Descriptors:	• health services • department of homeland security • medical personnel • public health • health care • supply chain • therapy • law • national governments • procurement	

	• best practices • congress • governments • homeland security
Why GAO Did This Study. As of February 17, 2021, the U.S. had about 27 million cumulative reported cases of COVID-19 and more than 486,000 reported deaths, according to the Centers for Disease Control and Prevention. The country also continues to experience serious economic repercussions. Five relief laws, including the CARES Act, have appropriated 3.1 trillion to address the public health and economic threats posed by COVID-19. The CARES Act also includes a provision for GAO to report on its ongoing monitoring and oversight efforts related to COVID-19. This testimony summarizes GAOs insights from its oversight of the federal governments pandemic response in a series of comprehensive reports issued from June 2020 through January 2021. In particular, the statement focuses on the public health response, including testing, vaccines and therapeutics, medical supply chain, health disparities, and health data. GAO reviewed data, documents, and guidance from federal agencies about their activities and interviewed federal and state officials and stakeholders for the series of reports on which this testimony is based.	

Tackling Urgent Health Security Risks During the COVID-19 Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1147512	2021-01-22	Approved for Public Release
Corporate Author:	MITRE Corp, Mclean, VA	
Descriptors:	• health services • public health • therapy • hygiene • disease outbreaks • supply chain • delivery of health care • medical countermeasures • small business • predictive modeling • procurement • security • social media • commerce	
The COVID-19 pandemic sparked an urgent need to solve massive healthcare supply-chain challenges, create innovative therapies, accelerate vaccines, reimagine public health services, and empower leaders with information to make life-and-death decisions amid high uncertainty.		

Audit of Department of Defense Implementation of Section 3610 of the Coronavirus Aid, Relief, and Economic Security Act		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1146143	2020-12-09	Approved for Public Release
Author:	Hull, Theresa	
Corporate Author:	Inspector General, Department of Defense, Arlington, VA	
Descriptors:	• business administration • information systems • contracts • economic security • national security • procurement • contractors • governments • homeland security • public health • quarantine • security • security personnel • small business	
The objective of this audit was to assess the DoDs implementation of section 3610 as authorized by the Coronavirus Aid, Relief, and Economic Security Act CARES Act, including whether contracting officers properly authorized and reimbursed contractor costs. The CARES Act did not provide specific appropriations for section 3610, but instead authorized agencies to use any legally available funds. See Appendix A for a discussion of the scope and methodology and for prior coverage.		

COVID-19 and Domestic PPE Production and Distribution: Issues and Policy Options		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1146332	2020-12-07	Approved for Public Release
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
The novel Coronavirus Disease 2019 (COVID-19) and its rapid emergence as a pandemic have highlighted issues relating to the production and distribution of personal protective equipment (PPE). PPE refers to worn articles or equipment that help minimize exposure to various hazards, including infectious pathogens. Given the role that PPE plays in mitigating the spread and reducing the impacts of COVID-19, PPE demand has spiked both globally and domestically while supply has been undercut by both rapid consumption as well as supply chain disruptions. According to multiple federal agencies, including the Government Accountability Office, the Food and Drug Administration, and various independent organizations, PPE continues to be in short supply, which has led to broad congressional and public interest in PPE production and distribution issues. The availability of effective PPE is		

critical to the ongoing pandemic response, but also has broader public health, emergency preparedness, and national security implications.

Financial Assistance: Lessons Learned from CARES Act Loan Program for Aviation and Other Eligible Businesses		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1153654	2020-12-10	Approved for Public Release
Author:	• Krause, Heather • MacLeod, Heather • Lofgren, Joanie • Abramowitz, Amy • Arnett, Sarah • Aussendorf, Paul • Carlson, Marcia • Erb, Mikey • Flores, Camilo • Hu, Ted • Jones, Delwen • Lee, K. F. • Luna-Long, Maureen • Mahmassani, Tarek • Ormond, Joshua • Pugnetti, Christie A. • Purcell, Stephanie • Rouse, Alexandra • Stone, Farrah • Temko-Blinder, Janet • Tierney, Patrick	
Corporate Author:	Government Accountability Office, Washington DC	
Descriptors:	• congress • law • business administration • House of Representatives • national governments • public health • small business • governments • national security • commerce • employment	

The COVID-19 pandemic has resulted in catastrophic loss of life and substantial damage to the global economy, including the aviation sector. U.S. passenger air carriers have lost almost 20 billion and over 47,000 jobs in 2020, with losses forecast to continue into 2021. In March 2020, Congress passed, and the President signed into law, the CARES Act, which provides over 2trillion in emergency assistance and health care response for individuals, families, and businesses affected by the COVID-19 pandemic, including businesses in the aviation sector. The CARES Act contained a provision for GAO to review the loans provided under the Act. This report examines, among other things, eligible businesses participation in the loan program and lessons learned from the program for Congress and Treasury. GAO reviewed Treasury documents and data on applications received and loans executed interviewed Treasury officials on the design and implementation of the program and interviewed eight industry associations that represent the range of businesses eligible for loans, eight passenger air carriers, and other selected applicants to gather their views on the program. GAO will continue to monitor and report on CARES Act assistance to the aviation industry. This oversight includes the loan program and another Treasury program--the Payroll Support Program--that provided assistance to certain aviation businesses to continue paying employee wages, salaries, and benefits.

COVID-19: Federal Efforts Could Be Strengthened by Timely and Concerted Actions		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1136639	2020-09-10	Approved for Public Release
Author:	Clowers, A. N.	
Corporate Author:	Government Accountability office, Washington DC	

As of September 10, 2020, the U.S. had over 6.3 million cumulative reported cases of COVID-19 and over 177,000 reported deaths, according to federal agencies. The country also continues to experience serious economic repercussions and turmoil. Four relief laws, including the CARES Act, were enacted as of September 2020 to provide appropriations to address the public health and economic threats posed by COVID-19. As of July 31, 2020, the federal government had obligated a total of 1.6 trillion and expended 1.5 trillion of the COVID-19 relief funds as reported by federal agencies on USAspending.gov. The CARES Act includes a provision for GAO to report bimonthly on its ongoing monitoring and oversight efforts related to the COVID-19 pandemic. This third report examines key actions the federal government has taken to address the COVID-19 pandemic and evolving lessons learned relevant to the nation's response to pandemics. GAO reviewed data, documents, and guidance from federal agencies about their activities and interviewed federal and state officials, as well as industry representatives.

Federalism: Opportunities Exist to Improve Coordination and Consultation with State and Local Governments		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1131091	2020-08-01	Approved for Public Release

Author:	Sager, Michelle
Corporate Author:	Government Accountability Office, Washington DC
Descriptors:	• public policy • business administration • personnel management • Department of State • environmental protection • national politics • Department of Homeland Security • Department of Veterans Affairs • governments • national governments • state governments • local governments • small business • congress

Planning For On-Campus K-12 Education During Covid-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1132123	2020-08-06	Approved for Public Release
Author:	• Byrne, Rich • Cassell, Gail H. • Downs, Matthew E. • Halamka, John • Kansagra, Shayri M. • Partners, Leavitt • Palekar, Rakhee • Ramaraju, Neelima • Rambhia, Kunal J. • Rudy, Kippy • Schnitzer, Jay • Wilkeron, Taylor	
Corporate Author:	MITRE Corp, Mclean, VA	
Descriptors:	• health services • geography • hygiene • quarantine • public health • disease outbreaks • California	

	• geographic regions • students • supply chain • application software • communication systems
The complex decision-making regarding reopening of schools compels careful thought, planning, and collaboration, within and across communities. Through this document, the COVID-19 Healthcare Coalition provides clarifications, interpretations, and estimates that can be used as a resource by school leaders to develop and implement plans for returning to on-campus learning, in the context of the COVID-19 pandemic. This document summarizes guiding principles and lessons learned, to provide current information as of publication date as well as additional resources to facilitate discussions and decisions regarding return to on-campus learning policies. The reopening of schools-either to virtual or on-campus learning is approaching quickly. Communities should give particular consideration to the socioeconomic challenges and disparities within their districts the need for transparency in development and implementation of plans and the provision of funding and resources to schools, teachers, and other school staff to ensure safety and efficacy of on-campus or virtual-learning environments.	

COVID 19: Opportunities to Improve Federal Response and Recovery Efforts		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1154273	2020-06-01	Approved for Public Release
Author:	Dodaro, Gene L	
Corporate Author:	United States Government Accountability Office	
Descriptors:	• health services • medical personnel • employment • business administration • personnel management • hygiene • quarantine • management personnel • disease outbreaks • military medicine • military science • therapy • interagency coordination • government procurement	
The outbreak of COVID-19 quickly spread around the globe. As of June 17, 2020, the United States had over 2 million reported cases of COVID-19, and over 100,000 reported deaths, according to federal agencies. Parts of the nation have also seen severely strained health care		

systems. Also, the country has experienced a significant and rapid downturn in the economy. Four relief laws, including the CARES Act, were enacted as of June 2020 to provide appropriations to address the public health and economic threats posed by COVID-19. In addition, the administration created the White House Coronavirus Task Force. The CARES Act includes a provision for GAO to report bimonthly on its ongoing monitoring and oversight efforts related to the COVID-19 pandemic. This initial report examines key actions the federal government has taken to address the COVID-19 pandemic and evolving lessons learned relevant to the nation's response to pandemics, among other things. GAO reviewed data and documents from federal agencies about their activities and interviewed federal and state officials as well as industry representatives. GAO also reviewed available economic, health, and budgetary data.

Audit of Contracts for Equipment and Supplies in Support of the Coronavirus Disease - 2019 (COVID-19) Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1121885	2020-04-30	Approved for Public Release
Author:	Hull, Theresa S.	
Corporate Author:	Office of the Inspector General, Department of Defense, Alexandria, VA	
Descriptors:	• laboratory equipment • personal protective equipment • protective equipment • Air Force • contracts • military medicine • acquisition • electronic mail • supply chain management • logistics • procurement • sustainment • business administration • finance • governments	
We plan to begin the subject audit in April 2020. The objective of this audit is to determine whether the DoD paid fair and reasonable prices for laboratory equipment and personal protective equipment procured in response to the COVID-19 pandemic. We may revise the objective as the audit proceeds, and we will also consider suggestions from management for additional or revised objectives. We will perform the audit at contracting offices within the Department of the Army, Department of the Navy, Department of the Air Force, Defense Health Agency, and Defense Logistics Agency that have awarded contracts in response to the coronavirus pandemic. We may identify additional locations during the audit.		

Congressional Oversight Provisions in the Coronavirus Aid, Relief, and Economic Security (CARES) Act (P.L. 116-136)		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1146832	2020-04-17	Approved for Public Release
Author:	• Wilhelm, Ben • Egar, William T.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
The Coronavirus Aid, Relief, and Economic Security CARES Act P.L. 116-136 includes a variety of oversight provisions designed to increase the information available to Congress regarding the federal governments implementation of the CARES Act and response to the COVID-19 pandemic more generally.		

Domestic Public Health Response to COVID-19: Current Status and Resources Guide		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1099626	2020-03-25	Approved for Public Release
Author:	• Sekar, Kavya • Cornell, Ada S.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• diseases and disorders • public health • emergency response	
This CRS Insight presents selected information and resources relevant to the domestic public health response to COVID-19 in containing and mitigating the spread and impact of the disease. As the situation evolves, CRS will continue to publish and update products relevant to the current needs of Congress. This Insight will be updated accordingly. This Insight does not provide information on the international response to COVID-19, or on economic or other nonhealth policy issues related to COVID-19. This Insight also does not address issues related to health insurance and financing, or human services. For further information on those issues, see the CRS Coronavirus Disease 2019 homepage.		

Department of Veterans Affairs' Potential Role in Addressing the COVID-19 Outbreak		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1099600	2020-03-20	Approved for Public Release
Author:	• Panangala, Sidath V. • Sussman, Jared S. • Dortch, Cassandria • Gaffney, Jonathan M. • Perl, Libby	

	• Salazar, Heather M.
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC
Descriptors:	• respiratory tract diseases • Department of Veterans Affairs • public health emergencies • emergency response • public health • therapy • medical personnel
This report provides an overview of VA's response thus far to this rapidly evolving COVID-19 pandemic. It does not provide an exhaustive description of all of the department's activities, and it is based on very limited publicly available information from VA.	

Another Coronavirus Emerges: U.S. Domestic Response to 2019-nCoV		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1149197	2020-01-29	Approved for Public Release
Author:	• Lister, Sarah A. • Sekar, Kavya	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• health services • disease outbreaks • congress • public health • quarantine • mers-cov • emergencies • hygiene • law • public health emergencies	
On December 31, 2019, the World Health Organization WHO was informed of a cluster of pneumonia cases in Wuhan, China. Illnesses have since been linked to a previously unidentified strain of coronavirus, designated 2019 novel Coronavirus, or 2019-nCoV. To date, thousands have been infected, mostly in China, and over 100 have died. The disease has spread to several other countries, including the United States. As the scope of the epidemic widened in China, the U.S. Centers for Disease Control and Prevention CDC stated on January 27, 2020, that the immediate health risk from the new virus to the general American public is low currently. With the situation rapidly changing, both WHO and CDC post frequent updates.		

Assessing Options for COVID-19 Payment Integrity Analytic Cells		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1137500	2020-01-01	Approved for Public Release
Author:	Milbourn, Gordon	
Corporate Author:	MITRE Corp, Mclean, VA	
Descriptors:	• governments • information exchange • environment • local governments • anomaly detection • cells • change detection • artificial intelligence • law enforcement • detection • security	
As of May 2020, the U.S. Congress and the Trump Administration have authorized more than 3 trillion in new money to counter the human and economic cost of the Coronavirus pandemic. The combination of the volume of funding, the wide array of uses, and the varying payment mechanisms present significant payment integrity risks. Along with the risk of errors in individuals' applications and agencies processing, fraudsters began their activities in the immediate aftermath of the enactment of the four statutes to date. For example, a major international fraud ring has already been identified attempting to secure fraudulent unemployment insurance payments from multiple states using stolen identities. With the immediate needs so great and the amount of funding at stake so significant, agencies and stakeholders must explore innovative new approaches to promote payment integrity. Analytic cells are one such approach a powerful, proven model that is available now.		

DoD Assistance and Lessons Learned

The National Guard and the COVID-19 Pandemic Response		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148935	2021-03-12	Approved for Public Release
Author:	Ott, Alan	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• congress • emergency response • law • department of homeland security • National Guard • federal law	

	• governments • public health • active duty • disasters • emergencies • medical personnel
The National Guard is a multi-role force at the disposal of governors and, when activated under federal law, at the disposal of the President. It has primary responsibility to support state and local government responses to disasters and emergencies DODI 3025.21. Such responses are part of the National Guard Civil Support NGCS mission, which is analogous to the Defense Support of Civil Authorities DSCA mission for active duty units DODD3025.18. NGCS is defined as support provided by the National Guard while in a State Active Duty status or Title 32 status to civil authorities for domestic emergencies, designated law enforcement, and other activities CNGBI3000.04. NGCS includes support to law enforcement agencies during civil disturbances NGR 500-5.	

Audit of Dual-Status Commanders for Use in Defense Support of Civil Authorities Missions in Support of the Coronavirus Disease-2019 Pandemic		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1147958	2021-02-05	Approved for Public Release
Author:	Vasquez, Richard B.	
Corporate Author:	Office of the Inspector General, Department of Defense, Alexandria, VA	
Descriptors:	• department of homeland security • best practices • homeland security • infectious diseases • National Guard • command and control • disasters • emergencies • homeland defense • security • active duty • Air Force • diseases and disorders • governments	
The objective of this audit was to determine whether DoD Components nominated, certified, and appointed Dual Status Commanders DSC in accordance with legal authorities and DoD policies for use in Defense Support of Civil Authorities DSCA missions in response to the outbreak of the coronavirus disease 2019 (COVID-19). COVID-19 is a viral respiratory illness caused by a novel coronavirus. The World Health Organization declared the global COVID-19		

outbreak a Public Health Emergency of International Concern on January 30, 2020, and labeled the outbreak as a pandemic on March 11, 2020. See Appendix A for a discussion of the scope and methodology and prior audit coverage related to the objective.

SARS-CoV-2 in the U.S. Military - Lessons for Civil Society		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1115092	2020-11-11	Approved for Public Release
Author:	Michael,Nelson L.	
Corporate Author:	Walter Reed Army Institute of Research, Silver Spring, MD	
Descriptors:	• disease outbreaks • military operations • quarantine • health services • military medicine • military personnel	
Barr and Podolsky recently commented in the Journal on the long-term influence that military medicine has historically had on medical practice in civil society. They specifically note how the accelerated medical advances made by the military were adopted in civilian sectors during and after World War II, which they discuss in the context of the coronavirus disease 2019 Covid-19 pandemic. The Department of Health and Human Services and the Department of Defense are using a framework to efficiently develop, test, and implement medical solutions to prevent, detect, and treat severe acute respiratory syndrome coronavirus 2 SARS-CoV-2 infection. Two articles now published in the Journal online November 11 speak to this historical dialogue they show how medical practices used in the military could inform civilian public health practices with respect to shared living situations during the Covid-19 pandemic.		

A Leader's Guide to Crisis Communication: Lessons from Ebola for COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104686	2020-06-30	Approved for Public Release
Author:	Tetteh, Hassan A	
Corporate Author:	Association of Military Surgeons of the United States, Gaithersburg, MD	
Descriptors:	• disease outbreaks • ebola virus • leadership • public health • United States Africa Command • West Africa • hospitals	

	• governments • medical personnel • health services

A crisis is defined as a critical turning point, a time of intense difficulty, or danger when an associated important decision is made to protect individuals from harm and save lives. Indeed, in their book Theorizing Crisis Communication, professors Timothy Sellnow and Matthew Seeger outline over 2 dozen typologies of crisis. They assert that a crisis poses a significant threat to high priority goals such as life, property, security, health, and psychological stability. Collectively, the threats to high priority goals create anxiety and stress, and often require some immediate action by leaders in response to the crisis to limit and contain harm. Clear communication by leaders during a crisis is essential to limit harm and ultimately resolve the crisis. General axioms of crisis communication include preparation, communication plan development, and coordination of message through designated personnel. However, even in the best cases, critical information can be lost in communication and consequently place lives at risk. The consideration of what to communicate and how to communicate during a crisis using lessons learned from the Ebola outbreak as well as lessons now emerging from the Coronavirus Disease 2019 COVID-19 pandemic is the focus of this perspective. This perspective offers practical guidelines for leaders identified here as the 3 Ws and 4Cs of crisis communication. These factors offer a checklist to be readily applied in a crisis, as well as in training for crisis response.

DARPA's Pandemic-Related Programs		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1106136	2020-06-30	Approved for Public Release
Author:	Gallo, Marcy E.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• national security • infectious diseases • biological warfare • biomedical research	

The Defense Advanced Research Projects Agency DARPA has contributed to the development of important military and commercial technologies, including stealth and personal electronics. DARPA's role and investments in defense-related research and development R and D, including biological defense, has potential significance for the science and technology available to address the Coronavirus Disease 2019 COVID-19 pandemic and any future biological threats. Advances in genome sequencing and editing, along with the application of engineering principles and computing and information sciences to the field of biology, have created opportunities to accelerate and expand the development of biotechnology products and processes. Although DARPA has invested in biological research since its establishment in 1958, in 2014 the agency created the Biological Technologies Office, which focuses specifically on the biological sciences and biotechnology.

Memorandum for SECDEF: Restore "Shock" in Strategic Planning		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104694	2020-05-05	Approved for Public Release
Author:	• Freier, Nathan • Hume, Robert • Schaus, John	
Corporate Author:	Army War College, Carlisle Barracks, PA	
Descriptors:	• national security • public health • leadership • risk analysis • federal budgets • influenza	
The Department of Defense (DOD) needs to re-institutionalize horizon scanning for strategic shock and integrate this perspective into its strategy, plans, and risk assessment. Defense-relevant strategic shocks are disruptive, transformational events for DOD. Though their precise origin and nature are uncertain, strategic shocks often emerge from clear trends. Shocks are often recognized in advance on some level but are nonetheless shocking because they are largely ignored.		

COVID-19: Defense Support of Civil Authorities		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1099638	2020-04-02	Approved for Public Release
Author:	• Kapp, Lawrence • Ott, Alan	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• aeromedical evacuation • combat support hospitals • disasters • governments • emergencies • public emergencies • hospitals • medical personnel	
The U.S. military has a long history of providing support to civil authorities, particularly in response to disasters or emergencies examples include responding to yellow fever epidemics in 1873 and 1878. The Department of Defense DOD defines defense support of civil authorities as Support provided by U.S. Federal military forces, DOD civilians, DOD contract personnel, DOD Component assets, and National Guard forces when the Secretary of Defense, in coordination with the Governors of the affected States, elects and requests to use those forces in Title 32, U.S.C., status in response to requests for assistance from civil		

authorities for domestic emergencies, law enforcement support, and other domestic activities, or from qualifying entities for special events. DOD Directive 3025.18, 18. Defense support of civil authorities for major incidents is typically carried out in accordance with the National Response Framework NRF, which is a guide to how the Nation responds to all types of disasters and emergencies. NRF, p. 2 Among other things, it establishes broad lines of authority for federal government agencies to prepare for and respond to any terrorist attack, major disaster, or other emergency.

Overview: The Department of Defense and COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1099586	2020-03-31	Approved for Public Release
Author:	McInnis, Kathleen J.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• missions • Unified Combatant Commands • National Guard • Personal Protective Equipment • military medicine • military capabilities • humanitarian assistance • construction • military strategy	
The Department of Defense DOD is one of many U.S. government agencies participating in the Federal Emergency Management Agency FEMA-led COVID-19 national response framework. As developments unfold, interest has grown regarding what DOD might be able to contribute to the U.S. governments COVID-19 response. On March 24, 2020, Secretary of Defense Esper stated that DODs top COVID-19 priorities are protecting the Defense Departments people, maintaining military readiness, and supporting the whole-of-government interagency response. With respect to whole-of-government response, below is a non-exhaustive survey of some DOD capabilities that might be applied to the current situation if directed to do so.		

Methods of Testing, Assays, and Reagents

A New, Simple, Rapid, On-Site Test for Detection of and Prevention from SARS-CoV Viruses		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1134058	2021-05-21	Approved for Public Release
Author:	• Rininsland, Frauke H. • Kane, Daniel J.	
Corporate Author:	Mesa Photonics	
Descriptors:	• health services	

	• medical personnel • mers-cov • disease outbreaks • proteins • cells • interferon • therapy • zoonoses • pulmonology • antigens • chemistry • detection • New Mexico • amino acids
Mesa Photonics developed a simple and fast test for detecting SARS coronavirus in infected cells. The test system consists of substrates that release fluorescent signals when they are cleaved by a SARS and a control protease. The Huorescent signals are detected simultaneously in one sample in a battery-operated handheld fluorometer. The SARS reporter substrate is not cleaved by human proteases or proteases from other coronaviruses. We demonstrate that 15,000 viruses can be detected in less than 6,000 cells in 15 minutes using crude, unpurified lysate.	

COVID-19 Testing: Frequently Asked Questions		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1131433	2020-08-11	Approved for Public Release
Author:	• Sarata, Amanda K. • Lee, Erica A. • Heisler, Elayne J. • Mendez, Bryce H. • Baumrucker, Evelyne P. • Panangala, Sidath V. • Costin, Kate M. • Sekar, Kavya • Forsberg, Vanessa C. • Staman, Jennifer A. • Hahn, Jim • Sussman, Jared S. • Isserman, Noah D. • Voorhies, Phoenix • Kolker, Abigail F.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	

Descriptors:	• health services • medical personnel • therapy • congress • military medicine • patient care • employment • emergency response • hygiene • law • Native Americans • public health • shortages (logistics) • delivery of health care

The United States is reporting some of the highest number of cases and deaths from the Coronavirus Disease 2019 (COVID-19) pandemic globally, and the disease is affecting communities nationwide. In response, federal, state, and local governments have undertaken containment and mitigation efforts to flatten the curve that is, to slow widespread transmission that could overwhelm the nation's health care system and to reduce spread of the disease while treatments and vaccines are being developed that will lessen the health impact of the virus. Diagnostic testing is a critical part of the clinical management of COVID-19, which is caused by the SARS-CoV-2 virus. Both diagnostic i.e., testing for active infection and serology testing i.e., testing for the presence of antibodies, potentially indicating a previous infection over a wide population may be a key component of efforts to ease mitigation measures and allow people to return safely to work and school. Ongoing testing can be used for public health purposes to identify and isolate positive cases of COVID-19, thereby reducing spread of the disease. However, the use of testing for public health purposes rather than for the clinical diagnosis of individuals poses legal and policy complications, because regulation and payment policies can differ based on how the test is used. Further, COVID-19 testing in the United States is provided in a number of health care and community-based settings. Insurance coverage and payment for a given COVID-19 test can depend on a number of factors, including the entity administering the test or processing test results, and the reason for which the test is administered. These factors can determine whether a certain payment mechanism may be used to pay for a given test. Congress, through several coronavirus legislative packages, has enacted various insurance coverage requirements along with other funding mechanisms to help pay for testing.

Evaluation of the Biomeme Franklin Human Performance Factors: Final Report		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105851	2020-08-10	Approved for Public Release
Author:	• Rivers, Bryan A. • Berk, Kimberly L.	

	• Blum, Steven M. • Buckley, Patricia E.
Corporate Author:	US Army CCDC CBC, Aberdeen Proving Grounds, MD
Descriptors:	• medical screening • bioassays • job training • human performance test
U.S. Army Combat Capabilities Development Command Chemical Biological Center CCDC CBC scientists completed an evaluation of the human performance factors related to the execution of COVID-19 testing using the SARS-CoV-2 Test Kit including 1) ease of use, 2) workflow development and assessment, and 3) time to results and sample throughput. The assay was found to require a fairly complex laboratory in order to safely process the samples due to the need for a biosafety cabinet to contain any SARS-CoV-2 containing aerosols. The workflow required nearly 3.5 h to complete 7 extractions, set up the seven RT-PCR reactions plus the two control RT-PCR reactions, run the RT-PCR on the Biomeme Franklin thermocycler, and interpret results. Therefore, throughput was estimated at 42 samples per 24 period on a single Franklin thermocycler.	

Universal and Serial Laboratory Testing for SARS-CoV-2 at a Long-Term Care Skilled Nursing Facility for Veterans-Los Angeles, California, 2020		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1103339	2020-05-29	Approved for Public Release
Author:	• Dora, Amy V. • Winnett, Alexander • Jatt, Lauren P. • Davar, Kusha • Watanabe, Mika • Sohn, Linda • Kern, Hannah S. • Graber, Christopher J. • Goetz, Matthew B.	
Corporate Author:	Veterans Affairs Greater Los Angeles Healthcare System, Los Angeles, CA	
Descriptors:	• public health • public health practice • California • delivery of health care • infection control • therapy • veterans health	

	• veterans (military personnel)

On March 28, 2020, two residents of a long-term care skilled nursing facility SNF at the Veterans Affairs Greater Los Angeles Healthcare System VAGLAHS had positive test results for SARS-CoV-2, the cause of coronavirus disease 2019 COVID-19, by reverse transcription-polymerase chain reaction RT-PCR testing of nasopharyngeal specimens collected on March 26 and March 27. During March 29-April 23, all SNF residents, regardless of symptoms, underwent serial approximately weekly nasopharyngeal SARS-CoV-2 RT-PCR testing, and positive results were communicated to the county health department. All SNF clinical and nonclinical staff members were also screened for SARS-CoV-2 by RT-PCR during March 29-April 10. Nineteen of 99 19 residents and eight of 136 6 staff members had positive test results for SARS-CoV-2 during March 28-April 10 no further resident cases were identified on subsequent testing on April 13, April 22, and April 23. Fourteen of the 19 residents with COVID-19 were asymptomatic at the time of testing. Among these residents, eight developed symptoms 1-5 days after specimen collection and were later classified as presymptomatic one of these patients died. This report describes an outbreak of COVID-19 in an SNF, with case identification accomplished by implementing several rounds of RT-PCR testing, permitting rapid isolation of both symptomatic and asymptomatic residents with COVID-19. The outbreak was successfully contained following implementation of this strategy.

Development and Commercialization of Analyte Specific Reagents (ASRs) for the Diagnosis of Selected Arthropod-Borne Viruses on FDA-Cleared Real-time PCR Platforms		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA577674	2012-10-01	Approved for Public Release
Author:	Ruth, Jerry L.	
Corporate Author:	Biosearch Technologies INC, Novato, CA	
Descriptors:	• arthropod born diseases • chain reactions • chemical agents • chikungunya virus • dengue • diptera • encephalitis • plasmids • ribonucleic acid • rift valley fever • synthesis • tickborne diseases • hemorrhagic fevers	

The primary goal of the Phase II Contract was to continue to design, manufacture, and test real time polymerase chain reaction qPCR reagents for detection of one or more of six potentially deadly arbovirus pathogens Dengue, Rift Valley Fever, Chikungunya, Crimean-

Congo Hemorrhagic Fever, Sand Fly Fever, and Tick-Borne Encephalitis viruses. The qPCR reagents being provided in Phase II are additional primers and probes signature sets for qPCR applications, as well as positive controls synthetic targets for the assays. Work product in Phase II included 1 design and synthesis of a synthetic target representing all four Dengue serotypes 2 cloning of a plasmid control for the new RT-qPCR signature set 4 qPCR testing of the new Dengue signature set, synthetic template, and plasmid control 5 determination of efficiency, Linearity of Range LOR, and Limit of Detection LOD for all eight qPCR signature sets 6 bioinformatic analysis and alignment of sequences published for the high priority agents listed 7 design and synthesis of a new consensus qPCR signature set for Dengue types 1-4 DENcon based on bioinformatics analysis of 42 Dengue subtypes 8 design and synthesis of a synthetic template for the consensus Dengue signature set 9 design and synthesis of a control plasmid ARBO9 containing sites for all eight signature sets 10 the testing of RNA generated from ARBO9 as a synthetic target and 11 stability testing of all reagents, including positive controls.

Diversity, Replication, Pathogenicity and Cell Biology of Crimean Congo Hemorrhagic Fever Virus		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA545591	2010-10-01	Approved for Public Release
Author:	Garcia-Sastre, Adolfo	
Corporate Author:	Mount Sinai School of Medicine, New York, NY	
Descriptors:	• vaccines • hemorrhagic fevers • therapy • clones • lethality • antiviral agents • pathogenesis • pathogenic microorganisms • anatomical models • peptide hydrolysis • chemical agents • macaque monkeys • proteins	

This research project was a result of a collaboration between three research groups aimed at elucidating basic replication processes of CCHFV with the expected outcome of providing basic research reagents and establishing the foundation of knowledge necessary for discovery of vaccines and antiviral therapeutics for Crimean Congo hemorrhagic fever. Our major findings during the total period of support were the following We have cloned and expressed all proteins of CCHFV. We found that the protease activity associated with the N-terminal of the L protein is responsible for overcoming innate immune responses mediated

by ubiquitin and by the ubiquitin-like molecule ISG15. We have identified inhibitors of this protease, and solved its structure. We have characterized in detail the processing of the G protein and the expression of the NSm protein of CCHFV, and developed constructs with fusogenic activity based on expression of the G ORF. We have successfully passaged CCHFV 18 times in SCID mice and conducted preliminary studies in macaques. We have confirmed that infection of STAT1 -- mice with CCHFV results in lethal disease, opening the possibility of using a mouse model of this virus. Our results have provided novel insights on the molecular biology of this highly pathogenic human virus and opened new avenues for the discovery of CCHFV antivirals.

Dual-Probe Real-Time PCR Assay for Detection of Variola or Other Orthopoxviruses with Dried Reagents		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA492054	2008-09-10	Approved for Public Release
Author:	• Aitichou, Mohamed • Saleh, Sharron • Kyusung, Park • Huggins, John • O'Guinn, Monica • Jahrling, Peter • Ibrahim, Sofi	
Corporate Author:	Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD	
Descriptors:	• bioassay • probes • detection • variola virus • drying • vaccina virus	

A real-time, multiplexed PCR assay based on dried PCR reagents was developed. Only variola virus could be specifically detected by a FAM 6-carboxyfluorescein-labeled probe while camelpox, cowpox, monkeypox and vaccinia viruses could be detected by a TET 6-carboxytetramethylrhodamine-labeled probe in a single PCR reaction. Approximately 25 copies of cloned variola virus DNA and 50 copies of genomic orthopoxviruses DNA could be detected with high reproducibility. The assay exhibited a dynamic range of seven orders of magnitude with a correlation coefficient value greater than 0.97. The sensitivity and specificity of the assay, as determined from 100 samples that contained nucleic acids from a multitude of bacterial and viral species were 96 for variola and 98 for orthopoxviruses, respectively. The limit of detection, sensitivity and specificity of the assay were comparable to standard real-time PCR assays with wet reagents. Employing a multiplexed format in this assay allows simultaneous discrimination of the variola virus from other closely-related orthopoxviruses. Furthermore, the implementation of dried reagents in real-time PCR assays

is an important step towards simplifying such assays and allowing their use in areas where cold storage is not easily accessible.

Bacterial-based Systems for Expression and Purification of Recombinant Lassa Virus Proteins of Immunological Relevance		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA486093	2008-06-06	Approved for Public Release
Author:	• Branco, Luis M. • Matschiner, Alex • Fair, Joseph N. • Goba, Augustine • Sampey, Darryl B. • Ferro, Philip J. • Cashman, Kathleen A. • Schoepp, Randal J. • Tesh, Robert B. • Bausch, Daniel G.	
Corporate Author:	Army Medical Research Institute of Infection Diseases, Fort Detrick, MD	
Descriptors:	• purification • lassa fever virus • immunology • glycoprotiens • nucleoprotiens • immunoassay • bacteria	
There is a significant requirement for the development and acquisition of reagents that will facilitate effective diagnosis, treatment, and prevention of Lassa fever. In this regard, recombinant Lassa virus LASV proteins may serve as valuable tools in diverse antiviral applications. Bacterial-based systems were engineered for expression and purification of recombinant LASV nucleoprotein NP, glycoprotein 1 GP1, and glycoprotein 2 GP2. RESULTS Full-length NP and the ectodomains of GP1 and GP2 were generated as maltose-binding protein MBP fusions in the Rosetta strains of Escherichia coli E. coli using pMAL-c2x vectors. Average fusion protein yields per liter of culture for MBP-NP, MBP-GP1, and MBP-GP2 were 10 mg, 9 mg, and 9 mg, respectively. Each protein was captured from cell lysates using amylose resin, cleaved with Factor Xa, and purified using size-exclusion chromatography SEC. Fermentation cultures resulted in average yields per liter of 1.6 mg, 1.5 mg, and 0.7 mg of purified NP, GP1 and GP2, respectively. LASV-specific antibodies in human convalescent sera specifically detected each of the purified recombinant LASV proteins, highlighting their utility in diagnostic applications. In addition, mouse hyperimmune ascitic fluids MHAF against a panel of Old and New World arenaviruses demonstrated selective cross reactivity with LASV		

proteins in Western blot and enzyme-linked immunosorbent assay ELISA. These results demonstrate the potential for developing broadly reactive immunological assays that employ all three arenaviral proteins individually and in combination.

Biological Agent Sample Preparation for the Detection and Identification of Multiple Agents by Nucleic Acid-Based Analysis		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA411664	2002-12-01	Approved for Public Release
Author:	Fields, Robert	
Corporate Author:	Xohox INC, Menlo Park, CA	
Descriptors:	• biological agents • deoxyribonucliec acids • biological detection • nucleic acids • bacteria • enzymes • test methods • clinical medicine • prototypes • purification • biological warfare • chemical agents • genetic engineering • ribonucleic acids • acids • genome	
We have designed, developed and tested an instrument prototype for automating the front end of nucleic acid test procedures. The AutoLyser instrument which we have developed, provides fully automated purification of viral, bacterial and human genomic DNA and RNA from clinical samples, cell culture and swabs in as little as 10 minutes, and is capable of purifying between 1 and 8 samples at a time. No manual steps are required during a purification run. Samples are rendered non-infectious and are processed inside a disposable plastic device which can be quickly attached or removed from the instrument by relatively unskilled technical personnel. The possibility of contact with an infectious sample is almost eliminated. Centrifugation is not required since reagents are moved within the sample cartridge by means of precision syringe pumps and reagent selection valves under software control. Purified nucleic acid template is eluted in water and is ready for use in PCR or other downstream operations.		

Pandemic Response Plans- Limited Sources and Surges

Summary of Strategies to Increase the Availability of ICU Ventilator Capability to COVID-19 Patients with Respiratory Failure		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1094005	2020-03-24	Approved for Public Release
Author:	Feldman, Jeffery M.	
Corporate Author:	Anesthesia Patient Safety Foundation (APSF) American Society of Anesthesiologists (ASA)	
Several strategies are available to increase the mechanical ventilation capability at institutions where the supply of ICU ventilators becomes inadequate to meet the needs of C19 patients. All of these strategies are underway at various stages and with different potential to address the problem. While there is existing equipment that can readily be repurposed, an important imperative is enhancing and coordinating manufacturing to produce not only new ventilation devices but also the disposables that will be essential including breathing circuits and viral filters. Maintaining an adequate supply and distribution of oxygen is also a critical need. The following is a summary of each strategy along with an assessment of what is needed to use the strategy effectively. The potential impact in terms of the number of devices that can be available, the timeframe and how they will be distributed are essential questions to address. Those questions remain to be answered and will require a coordinated task force with the responsibility and authority to take action.		

Hospital Viability during a Pandemic Influenza Outbreak		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA501495	2009-06-01	Approved for Public Release
Author:	Blackwell, Jeffrey K.	
Corporate Author:	Army Command and General Staff College, Fort Leavenworth, KS	
Descriptors:	• crisis management • national security • influenza • protective equipment • emergencies • health care facilities • catastrophic conditions • law enforcement • public safety • health care management • hospitals • disasters • logistics	
In the past 8 years since September 11, many improvements have been made to the National response capabilities however, the all hazards approach is still inadequate to respond to a		

moderate pandemic outbreak. Shortcomings of our fragile healthcare framework combined with the prolonged duration of a pandemic make it difficult to prepare for such a catastrophic disaster. Therefore, the purpose of this study was to investigate the factors ensuring hospital viability during a pandemic influenza outbreak. To accomplish this, the study employed a comparative case study methodology utilizing four prominent emergency management events 1918, Spanish flu H1N1 2003, SARS outbreak 2005, Hurricane Katrina, and the 2009, Swine flu H1N1 outbreak, for the purpose of finding common measures enabling a hospital to mitigate, prepare, respond, and recover from a pandemic. After reviewing the case study literature, 117 viability measures were identified. Furthermore, the concepts from the literature review coupled with the case study results led to discovery of seven hospital viability measures that will assist in mitigating a moderate pandemic, which are maintaining a hospital critical axis, staffing, security, logistics, surge capacity, public affairs, and emergency operations planning. Focusing preparedness efforts in these areas will provide protection from the next pandemic.

Regional Mass Fatality Management in Pandemic Surge		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA493923	2008-12-01	Approved For Public Release
Author:	Stanley, Sharon A.	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	• public health • death • interagency coordination • catastrophic conditions • surges • influenza • state government • local government • causalities • planning	

National and state planning documents designate public health as the lead for mass fatality management (MFM). MFM planning, however, demands multiagency participation and full public-business-government leverage. This thesis explores pathways to reach operational regional MFM capability in Ohio, but also has implications for MFM planning across the nation. Survey research was conducted with three key MFM stakeholder groups county coroners, emergency management directors, and health commissioners. The survey addressed realistic and actionable MFM planning by 1) identifying state guidance gaps 2) identifying local regional operational gaps 3) assessing regional resource capabilities 4) categorizing proposed solutions to address identified gaps and 5) listing legal, financial, and organizational barriers to the solutions. Findings show that the key stakeholder communities are confused, with a willingness to build MFM capacity that is accompanied by worries about who should lead and how to coordinate efforts. Research recommendations include a three-

sector collaboration government-business-citizens operating at the regional level and public engagement. Another recommendation calls for alignment of state guidance and regional operations with The Joint Task Force Civil Support Working Group MFM areas command and control body identification medico-legal investigation morgue operations funeral services final disposition and family assistance and behavioral health services.

Pandemic Responses and Plans

Preparing for the Next Pandemic: How Can Navy Personal Protective Equipment Resupply Be Improved?

Accession Number:	Report Date:	Access Restrictions:
AD1150933	2021-06-01	Approved for Public Release
Author:	Encoy, Michael C	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	• medical personnel • health services • military medicine • naval warfare • Navy • naval operations • supply chain management • hygiene • supply chain • logistics • USS Arleigh Burke • USS Theodore Roosevelt • disease outbreaks	

As a result of the COVID-19 pandemic, Commander, Naval Surface Forces U.S. Pacific Fleet (CNSP) is reevaluating shipboard allowances of medical supplies/Personal Protective Equipment (PPE). We sought to positively impact the response at the ship and fleet levels through an evaluation of notional modifications to supply chain practices, thus increasing resiliency for the next pandemic. An exploratory sequential mixed-method research design was used to address two research questions. (1) How can the Navy provide frontline subject matter experts the means to efficiently and accurately track PPEs during COVID-19 type pandemics? (2) How can the Navy determine a reasonable onboard allowance for pandemic-related PPE (given limits on shipboard storage and Authorized Medical Allowance List [AMAL] composition), and an empirically-sound prediction for the usage rate of each category of PPE during a pandemic? The findings identified potential areas of improvement in training, operational supply chain practices, and on-hand N95 mask DDG inventory. To establish viable PPE supply chain management practices, we illustrate how enhanced data standards might be implemented using an optimized Re-order Point (ROP) model, as well as a sustainment of

AMAL review boards. We also offer that supply chain training for corpsmen might offer potential improvement to overall shipboard inventory

Depot Maintenance: DoD Should Improve Pandemic Plans and Publish Working Capital Fund Policy		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1149483	2021-04-01	Approved for Public Release
Author:	• Maurer, Diana • Khan, Asif A.	
Corporate Author:	Government Accountability Office, Washington, DC	
Descriptors:	• personnel management • medical personnel • logistics • congress • information systems • United States Transportation Command • financial management • civilian personnel • House of Representatives • business administration • commerce	
Pandemics such as COVID-19 can impact the productivity of critical DOD depots that maintain weapon systems if essential personnel are unable to report for work. Navy and Air Force WCFs must also maintain cash balances sufficient for the activities they support, including the eight depots operated by the Marine Corps, Navy, and Air Force, to sustain readiness. GAO was asked to assess the effects of COVID-19 on WCF and depot operations as part of its CARES Act oversight. This report 1) describe show COVID-19 impacted Marine Corps, Navy, and Air Force depot productivity 2) examines the extent to which depot actions in response to COVID-19 addressed key practices to support the workforce, continue operations, and improve crisis response and 3) examines the extent to which WCF cash management policy ensured financial solvency and reflected current guidance. GAO reviewed DOD guidance, depot revenue data for fiscal year 2020, and documents related to the impact of COVID-19 on productivity and WCF solvency and interviewed depot and financial management officials.		

COVID-19: Urgent Actions Needed to Better Ensure an Effective Federal Response		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1149402	2020-11-01	Approved for Public Release
Author:	Clowers, A. N.	
Corporate Author:	Government Accountability Office, Washington DC	
Descriptors:	• health services	

	• medical personnel • geography • business administration • employment • quarantine • therapy • hygiene • management personnel • military medicine • personnel management • public policy • congress • infectious diseases • ethnic groups
As of November 12, 2020, the U.S. had over 10.3 million cumulative reported cases of COVID-19 and about 224,000 reported deaths, according to federal agencies. The country also continues to experience serious economic repercussions. Four relief laws, including the CARES Act, were enacted as of November 2020 to provide appropriations to address the public health and economic threats posed by COVID-19. As of September 30, 2020, of the 2.6 trillion appropriated by these acts, the federal government had obligated a total of 1.8 trillion and expended 1.6 trillion of the COVID-19 relief funds, as reported by federal agencies. GAO reviewed data, documents, and guidance from federal agencies about their activities and interviewed federal and state officials. GAO also sent a survey to public health and emergency management officials in the 50 states, Washington, D.C., and the five U.S. territories regarding medical supplies.	

Preparing The USAF Contracting Career Field for the Next Humanitarian Assistance Disaster Response Within the Continental United States		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1126765	2020-12-01	Approved for Public Release
Author:	• Bender, Geoffrey S • Lehocky, Chase	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	• health services • business administration • warfare • department of homeland security • management personnel • medical personnel • Air Force • United States Northern Command	

	• emergency response • environmental protection • humanitarian assistance • logistics • electronic mail • national governments • supply chain management • civil engineering • contracts
This projects focus is on the alignment of a U.S. Air Force USAF exercise design process with FEMAs challenges regarding humanitarian assistance and disaster response HADR events. The authors applied Joint Publication 4-10 and Yoder's Three Tier Model approach to inform a disaster model that delineates roles and responsibilities for stakeholders. The authors also reviewed 104 after-action reports to identify trends within FEMAs 15 emergency support functions and added three more categories to capture trends finance, manpower, and training. This research resulted in six recommendations to the USAF contracting exercise designers 1) ensure that exercise frameworks are aligned to the lead agency 2) consolidate the many advance contracts throughout the federal agencies into one location such as Acquisition Gateway or GSA Advantage, or on a SharePoint site 3) continue adopting category management practices within the disaster environment in order to effectively implement advance contracts 4) further refine the career field education training plan with tiered development under a synthesized HADR framework 5) consolidate the federal external stakeholders into a simplified location to improve the ability to research trends within the USAF contracting career field and 6) ask other federal agencies for their approaches while de-conflicting procurement strategies.	

Coronavirus Disease 2019 (COVID-19) Pandemic: Review of Guidelines for Resuming Non-urgent Imaging and Procedures in Radiology During Phase 2		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105904	2020-06-01	Approved for Public Release
Author:	• Azam, Saif A. • Myers, Lee • Fields, Brandon K. • Demirjian, Natalie L. • Patel, Dakshesh • Roberge, Eric • Gholamrezanezhad, Ali • Reddy, Sravanthi	
Corporate Author:	Madigan Army Medical Center, Tacoma, WA	
Since the spread of the coronavirus disease 2019 COVID-19 was designated as a pandemic by the World Health Organization, health care systems have been forced to adapt rapidly to		

defer less urgent care during the crisis. The United States U.S. has adopted a four-phase approach to decreasing and then resuming non-essential work. Through strong restrictive measures, Phase I slowed the spread of disease, allowing states to safely diagnose, isolate, and treat patients with COVID-19. In support of social distancing measures, non-urgent studies were postponed, and this created a backlog. Now, as states transition to Phase II, restrictions on non-essential activities will ease, and radiology departments must re-establish care while continuing to mitigate the risk of COVID-19 transmission all while accommodating this backlog. In this article, we propose a roadmap that incorporates the current practice guidelines and subject matter consensus statements for the phased reopening of non-urgent and elective radiology services. This roadmap will focus on operationalizing these recommendations for patient care and workforce management. Tiered systems are proposed for the prioritization of elective procedures, with physician-to-physician communication encouraged. Infection control methods, provision of personal protective equipment PPE, and physical distancing measures are highlighted. Finally, changes in hours of operation, hiring strategies, and remote reading services are discussed for their potential to ease the transition to normal operations.

Advanced Preparation Makes Research in Emergencies and Isolation Care Possible: The Case of Novel Coronavirus Disease (COVID-19)		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1105931	2020-03-30	Approved for Public Release
Author:	• Brett-Major, David M • Schnaubelt, Elizabeth R • Creager, Hannah M • Lowe, Abigail • Cieslak, Theodore J • Dahlke, Jacob M • Johnson, Daniel W • Fey, Paul D • Hansen, Keith F • Hewlett, Angela L • Gordon, Bruce G • Kalil, Andre C • Khan, Ali S • Kortepeter, Mark G • Kratochvil, Christopher J • Larson, LuAnn • Levy, Deborah A • Linder, James • Medcalf, Sharon J • Rupp, Mark E • Schwedhelm, Michelle M	

	• Sullivan, James • Vasa, Angela M • Wadman, Michael C • Lookadoo, Rachel E • Lowe, John-Martin J • Lawler, James V • Broadhurst, M J
Corporate Author:	University of Nebraska Medical Center Omaha
Descriptors:	• respiratory tract diseases • public health emergencies • public health • therapy • quarantine • health services
The optimal time to initiate research on emergencies is before they occur. However, timely initiation of high quality research may launch during an emergency under the right conditions. These include an appropriate context, clarity in scientific aims, preexisting resources, strong operational and research structures that are facile, and good governance. Here, Nebraskan rapid research efforts early during the 2020 coronavirus disease pandemic, while participating in the first use of U.S. federal quarantine in 50 years, are described from these aspects, as the global experience with this severe emerging infection grew apace. The experience has lessons in purpose, structure, function, and performance of research in any emergency, when facing any threat.	

Urban Outbreak 2019 Pandemic Response: Select Research and Game Findings		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1094710	2020-04-01	Approved for Public Release
Author:	• Davies, Benjamin • Lovett, Kaitlin R. • Card, Brittany • Polatty , David	
Corporate Author:	NAVAL WAR COLLEGE, NEWPORT RI	
This document is a summary of 16 key research and game findings focused specifically on the characteristics of civil-military response to a pandemic scenario. The numbered bullets below correspond to more detailed explanations of findings presented later in the document. While these findings are in no way definitive or complete, they are a sampling of relevant guidance based on research, gaming and expert opinion. It is our hope that these 16 findings will contribute to improving civilian and military effectiveness in humanitarian assistance and disaster response operations.		

National Biodefense Strategy: Opportunities and Challenges with Early Implementation		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1098879	2020-03-11	Approved for Public Release
Author:	• Currie, Chris P. • Denigan-Macauley, Mary	
Corporate Author:	Government Accountability Office, Washington DC	
Descriptors:	• national security • governments • environmental protection • homeland security • national governments • public health • security • diseases and disorders • disease outbreaks • risk management • congress	
We are pleased to be here today to discuss our recently issued work on the National Biodefense Strategy. Catastrophic biological threats highlight the inextricable link between security and public health concerns. These threats whether naturally-occurring, intentional, or accident al have the potential to cause loss of life and sustained damage to the economy, societal stability, and global security. The vast and evolving biological threat landscape includes threats of naturally-occurring infectious diseases, bioterrorism, and safety and security lapses at facilities that house biological threat agents. For example, the unpredictable nature of naturally-occurring disease, such as the novel coronavirus COVID-19, poses a threat to humans. As of March 5, 2020, COVID-19 has spread from China to nearly 80 countries, including the United States, which has over 150 cases and nearly a dozen deaths associated with the virus. This novel virus poses a public health and economic threat, and may eventually be declared a pandemic, as seen with severe acute respiratory syndrome SARS in 2003. Infectious diseases, such as coronaviruses, can be transmissible from animals to humans, demonstrating how our relationships with animals may increase the risk of disease transmission among people, pets, livestock, and wildlife.		

Periodic Refresher Emails for Emergency Department Mass Casualty Incident Plans		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1087138	2020-11-04	Approved for Public Release
Author:	• Carlson, Krista R • Nelson, Jessie G • Hevesi, Sara • Welborn, Robert • Eide, Benjamin	

	• Winkler, Meredith • Peterson, Marissa K • Ramey, Elizabeth
Corporate Author:	59th Medical Wing, San Antonio, TX
Descriptors:	• patient care • emergencies • paramedics • training • casualties
Audience and type of curriculum: This mass casualty incident MCI curriculum is intended for use as refresher content in the months between more formal education, such as hands-on MCI training and drills. The target audience for each topic varies, but the majority of them apply to all disciplines such as direct patient care roles emergency room technicians, nurses, paramedics, practitioners, etc. and emergency department clerks coordinators. Topics intended for only one or more discipline are labeled as such. See curriculum chart or email schedule Appendix AK for details.	

A Model Of Creating Inpatient Hospital Surge Capacity Through Early Discharge		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1065361	2018-09-01	Approved for Public Release
Author:	Dunne, William J.	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	• emergency response • physicians • emergencies • disaster management • disasters • health care facilities • patient care • medical personnel • health services	
When catastrophic disasters strike, health care systems are often faced with overwhelming volumes of patients to treat patient surge. While many governmental and policy organizations have outlined recommendations to build surge capacity, there has been little research on specific strategies to accommodate these significant patient loads. Specifically, a concept known as reverse triage, which allows clinicians to assess current patients for possible discharge or reduction in the level of their clinical care, is still poorly understood. This research study investigated the utility of a structured assessment tool to predict the ability of a current patient to be discharged or downgraded in the event of a catastrophic disaster. Clinicians were provided a mock scenario and asked to use their clinical judgment or a structured assessment tool. The charts of patients were then reviewed 96 hours after the		

assessments were completed to determine whether predictions were accurate. This pilot study showed that the assessment tool was slightly better at predicting which patients could be safely discharged and which needed to remain admitted. This project serves as a first foray of research into this area and will initiate broader discourse and additional studies. The goal is to provide clinicians with stronger guidance vetted in scientific evidence and supported in ethical, legal, and moral context to make difficult decisions in the face of catastrophic disaster situations.

Defense Civil Support: DOD, HHS, and DHS Should Use Existing Coordination Mechanisms to Improve Their Pandemic Preparedness		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1026954	2017-02-01	Approved for Public Release
Author:	Kirschbaum, Joseph W.	
Corporate Author:	Government Accountability Office, Washington DC	
Descriptors:	• interagency coordination • health services • medical personnel • public health • hygiene • humanitarian assistance	
The U.S. Army estimates that if a severe infectious disease pandemic were to occur today, the number of U.S. fatalities could be almost twice the total number of battlefield fatalities in all of America's wars since the American Revolution in 1776. A pandemic occurs when an infectious agent emerges that can be efficiently transmitted between humans and has crossed international borders. DOD's day-to-day functioning and the military's readiness and operations abroad could be impaired if a large percentage of its personnel are sick or absent, and DODs assistance to civil authorities might be limited. House Report 114-102 included a provision for GAO to assess DOD's planning and coordination to support civil authorities during a pandemic. This report assesses the extent to which 1 DOD has guidance and plans for supporting civil authorities in the event of a domestic outbreak of a pandemic disease and 2 HHS and DHS have plans to respond to a pandemic if DOD support capabilities are limited, and they have mechanisms to coordinate their pandemic preparedness and response. GAO reviewed agency pandemic guidance and plans, interagency coordination mechanisms, and pandemic-related exercises and after-action reports.		

Surviving the Storm: Expanding Public Health's Capabilities in Response to the Increasing Threats Posed by Novel Viruses		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA621630	2013-12-01	Approved for Public Release
Author:	Mackie, Daniel P.	

Corporate Author:	Naval Postgraduate School, Monterey, CA
Descriptors:	• antiviral agents • influenza virus • medicine • public health • antibiotics • cytokines • drugs • epidemiology • filters • stockpiles • therapy • threats
As the planet's population continues to grow at rate that will see a global population of nine billion people by the year 2050, is an era being entered into which pandemics involving novel viruses are the new norm If that idea is possible, then are drug therapies approved by the FDA or in the pipeline for its approval available that either limit virus replication within a host cell, or reduce the body s hyper-immune response also known as cytokine storm to novel or pandemic strain viruses with which states could supplement their existing stockpiles This research explores six classes of medications that could potentially assist state-level governments in expanding their state-level stockpiles, to include more treatment and prophylaxis options, in the face of pandemics involving novel viruses. The results of this research were filtered through three criteria medical efficacy, cost, logistical considerations that narrow the field of candidate therapies down to four specific findings one generic version of the antiviral called Ribavirin, and generic versions of the statins called Lipitor, Zocor and Gemfibrozil. This research may be applied to state and local-level public health agencies interested in bolstering their existing stockpiles for pandemic preparedness.	

Personal Protective Equipment (PPE)

Personal Protective Equipment Optimization Validation		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1116959	2020-09-24	Approved for Public Release
Author:	• Stanek, Clay • Werner, Thomas	
Corporate Author:	Research Facilitation Laboratory, Army Analytics Group	
Descriptors:	• neural networks • personal protective equipment • protective equipment • algorithms • computational science • information science	

	• logistics • annealing • data science • health services • optimization • supply chain • statistics
The Research Facilitation Laboratory RFL Investigated the logistical benefit to the COVID-19 pandemic using a specialized optimization HW platform known as a Digital Annealer manufactured by the Fujitsu Corporation. The goal of using the DA is to show that highly computationally and combinatorically complex problems are solvable in a fraction of the time on standard CPUs and also capable of generating near-theoretically optimal solutions. This particular problem involved the logistics of transferring PPE supply to PPE demand areas that minimized the mileage traveled while also meeting the demand need as close to full as possible given supplies.	

DIY Face Mask Effectiveness Against COVID-19		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1106208	2020-05-03	Approved for Public Release
Author:	• Trice, Joshua • Mainolfi ,James	
Corporate Author:	711th Human Performance Wing, Wright-Patterson AFB, OH	
Descriptors:	• protective masks • public health • personal protective equipment • bacteriophages • hygiene • quarantine • vulnerability • respirators	
This paper addresses the question of how effective Do It Yourself DIY Personal Protective Equipment PPE, i.e. face masks, are within the general population in mitigating the spread of COVID-19. It references studies comparing the effectiveness of various materials in DIY masks alongside surgical masks and respirators. This is associated with the Department of Defense's COVID-19 announcement for all Total Force members military personnel, civilian employees, contractors and their family members to wear a cloth face covering in public settings where social-physical distancing measures are difficult to maintain, especially in areas of significant community-based transmission. Studies have shown that holistically given a variety of factors that are discussed in depth in this paper a single layer pillowcase or a 100% cotton t-shirt are the most suitable household materials for an improvised DIY face mask. This is due to their breathability, fit factor, and their ability to reduce viral particle transmission by up to 50%. In		

general, using any type of face mask can decrease viral transmission. However, it is important not to focus on a single intervention in the case of a pandemic, but rather to integrate all effective interventions for optimal protection. A DIY face mask will not completely eliminate the possibility of infection with COVID-19, particularly given that there are multiple routes of transmission. But the underlying consensus of all research suggests that DIY cloth facemasks are better than nothing at all. It is vital to note that all DIY face masks, regardless of the efficiency of their filtration or seal, will only have partial effectiveness on their own. They must be used in conjunction with other preventative measures, which include isolation of infected individuals, immunization, maintaining healthy eating fitness standards, cough and respiratory etiquette, and regular hand hygiene.

Aerosol Filtration Efficiency of Common Fabrics Used in Respiratory Cloth Masks		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1097926	2020-04-24	Approved for Public Release
Author:	• Konda, Abhiteja • Prakash, Abhinav • Moss, Gregory A. • Schmoldt, Michael • Grant, Gregory D. • Guha, Supratik	
Corporate Author:	Argonne National Laboratory, Lemont, IL	
Descriptors:	• protective masks • personal protective equipment • aerosols • respiratory tract diseases • filtration • efficiency • fabrics • textiles • particle size • disease outbreaks • particulates • porosity • hygiene • fibers	
The emergence of a pandemic affecting the respiratory system can result in a significant demand for face masks. This includes the use of cloth masks by large sections of the public, as can be seen during the current global spread of COVID-19. However, there is limited knowledge available on the performance of various commonly available fabrics used in cloth masks. Importantly, there is a need to evaluate filtration efficiencies as a function of aerosol particulate sizes in the 10 nm to 10 micron range, which is particularly relevant for		

respiratory virus transmission. We have carried out these studies for several common fabrics including cotton, silk, chiffon, flannel, various synthetics, and their combinations. Although the filtration efficiencies for various fabrics when a single layer was used ranged from 5 to 80 and 5 to 95 for particle sizes of 300 nm and 300 nm, respectively, the efficiencies improved when multiple layers were used and when using a specific combination of different fabrics. Filtration efficiencies of the hybrids such as cotton-silk, cotton-chiffon, cotton-flannel was 80 for particles300 nm and 90 for particles 300 nm. We speculate that the enhanced performance of the hybrids is likely due to the combined effect of mechanical and electrostatic-based filtration. Cotton, the most widely used material for cloth masks performs better at higher weave densities i.e., thread count and can make a significant difference in filtration efficiencies. Our studies also imply that gaps as caused by an improper fit of the mask can result in over a 60 decrease in the filtration efficiency, implying the need for future cloth mask design studies to take into account issues of fit and leakage, while allowing the exhaled air to vent efficiently. Overall, we find that combinations of various commonly available fabrics used in cloth masks can potentially provide significant protection against the transmission of aerosol particles.

Development of an Advanced Respirator Fit Test Headform (Postprint)		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA594887	2012-11-01	Approved for Public Release
Author:	• Bergman, Michael S. • Zhuang, Ziqing • Palmiero, Andrew • Shaffer, Ronald E. • Hanson, David • Heimbuch, Brian K. • McDonald, Michael • Husband, Michael • Wander, Joseph D.	
Corporate Author:	National Institute for Occupational Safety and Health, Pittsburg, PA	
Descriptors:	• respirators • test equipment • aerosols • particles	

Improved respirator test headforms are needed to measure the fit of N95 filtering facepiece respirators FFRs for protection studies against viable airborne particles. The objective of this study was to develop and evaluate a medium-size Static i.e., non-moving, non-speaking Advanced headform StAH for fit testing N95 FFRs. The StAH was developed based on the anthropometric dimensions of a digital headform reported by the National Institute for Occupational Safety and Health and has a silicone polymer skin with defined local tissue thicknesses. Quantitative fit tests were performed on seven N95 FFR models of various sizes and designs. Donnings were performed with and without a pre-test seal checking method.

For each method, four replicate FFR samples were tested of each of the seven models with two donnings per replicate, resulting in a total of 56 tests per donning method. Each fit test was comprised of three one-minute exercises Normal Breathing NB, 11.2 liters per minute lpm, Deep Breathing DB, 20.4 lpm, then NB again. A fit factor FF for each exercise and an overall test FF were obtained. Analysis of variance methods were used to identify statistical differences among FFs analyzed as logarithms for different FFR models, exercises, and donning methods. For each FFR model and for each donning method, the NB and DB FF data were not significantly different p 0.05. Significant differences were seen in the overall exercise FF data for the two donning methods among all FFR models pooled data and in the overall exercise FF data for the two donning methods within certain models. A seal-checking method improved the frequency of obtaining overall exercise FFs 100. The FFR models, which are expected to achieve FFs 100 on human subjects, achieved FFs 100 on the StAH. Further research is needed to evaluate the correlation of FFR fit on the StAH to FFR fit on people.

A Pandemic Influenza Preparedness Study: Use of Energetic Methods to Decontaminate Filtering Facepiece Respirators Contaminated with H1N1 Aerosols and Droplets (POSTPRINT)		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA560922	2012-06-01	Approved for Public Release
Author:	• Heimbuch, Brian K. • Wallace, William H. • Kinney, Kimberly R. • Lumley, April E. • Wu, Chang-Yu • Woo, Myung-Heiu • Wander, Joseph D.	
Corporate Author:	Applied Research Associates INC, Tyndall AFB, FL	
Descriptors:	• filters • protective mask facepieces • ultraviolet radiation • aerosols • biocides • contamination • decontamination • detection • energetic properties • energy • germicides • heat • irradiation • steam • strategy	

	• toxicity

A major concern among healthcare experts is a projected shortage of N95 filtering facepiece respirators FFRs during an influenza pandemic. One option for mitigating an FFR shortage is to decontaminate and reuse the devices. Many parameters must be evaluated to verify the effectiveness of this strategy biocidal efficacy, filtration performance, pressure drop, fit, and residual toxicity. The focus of this research effort was to evaluate the ability of microwavesteam energy, low-temperature moist heat, and ultraviolet germicidal irradiation at 254 nm to decontaminate H1N1 influenza virus loaded onto FFRs as either aerosols or droplets. Our data indicate that all three decontamination technologies provide 4-log reduction of viable H1N1 virus --in 93 of our experiments, the virus was removed to levels below the method detection limit. These data are encouraging and may contribute to the evolution of effective strategies for decontamination and reuse of FFRs.

Stopping the Spread

Estimators for Disease Dynamics with Imperfect Surveillance		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1153457	2021-11-01	Approved for Public Release
Author:	Ingersoll, Tom	
Corporate Author:	U.S. Army Combat Capabilities Development Command, Chemical Biological Center, Aberdeen Proving Ground, MD	
Descriptors:	• quarantine • health services • public health • disease outbreaks • predictive modeling • estimators • detection • hygiene • infection • sampling • wound infections	

This report presents a method for estimating infective disease-dynamics parameters when contact rates are uneven, surveillance data are not systematically sampled, and cases are underreported. An important parameter for predictive infectious disease models is the effective reproductive number Re. Re determines the rate at which new infections occur and respond to intervention strategies, such as vaccination, quarantine, and social distancing. However, accurate estimation of Re is complicated by shortcomings in surveillance data collection, and these shortcomings are difficult to mitigate through changes in sampling methods. The author proposes that estimation of Re is not necessary to model changes in disease dynamics rather, the basic reproductive number R0 may be used along with contact parameters derived from network characteristics within the host population. In addition,

estimates of R0 can be derived from imperfect surveillance data through application of hierarchical methods that correct for underreporting by using explicit estimates of detection probabilities. A hierarchical data-assimilative method for improving parameter estimates in predictive models when data are imperfectly collected is demonstrated in this report. Accurate estimates of changes in disease dynamics can inform management decisions and mitigation strategies.

Before and After: The Impact of the COVID-19 Pandemic on Influenza-Like Illness Trends in PAIVED		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151875	2021-11-01	Approved for Public Release
Author:	• Hrncir, David E. • Colombo, Rhonda E. • Richard, Stephanie A. • Schofield, Christina • Collins, Limone • Ganesan, Anuradha • Geaney, Casey • Lalani, Tahaniyat • Markelz, Ana • Maves, Ryan C. • McClenathan, Bruce • Mende, Katrin • Modi, Jitendrakumar R. • Montgomery, Jay R. • Seshadri, Srihari • Skerrett, Catherine • Spooner, Christina • Utz, Gregory • Warkentien, Tyler • Williams, Alan • Burgess, Timothy H • Coles, Christian L	
Corporate Author:	59th Medical Wing	
Descriptors:	• military medicine • vaccines • active duty • disease outbreaks • health • infection control	

	• Air Force • diseases and disorders • influenza • information science
In early March 2020, influenza activity in the United States dropped precipitously and remained lower than typical for the rest of the 2019-20 and the 2020-21 influenza seasons Widespread interventions aimed at reducing the spread of COVID-19, e.g. social distancing, are thought to have led to these lower influenza rates. However, other factors, such as limited access to care and decreased influenza testing, have also been postulated.	

Compliance and Performance Characteristics of Subject Collected Versus Health-care Worker Collected Nasal Swabs for Respiratory Viral Surveillance		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151879	2021-11-01	Approved for Public Release
Author:	• Hrncir, David E. • Kautz, Michelle • Epsi, Nusrat J. • Richard, Stephanie A. • Colombo, Rhonda E. • Ganesan, Anuradha • Collins, Limone • Burgess, Timothy H. • Maves, Ryan • Markelz, Ana E. • Geaney, Casey • Seshadri, Srihari • Utz, Gregory • Mende, Katrin • Modi, Jitendrakumar R. • Fries, Anthony C. • McClenathan, Bruce • Schofield, Christina • Montgomery, Jay R. • Skerrett, Catherine • Spooner, Christina • Coles, Christian L • Lalani, Tahaniyat	
Corporate Author:	Uniformed Services University of the Health Sciences, Bethesda, MD	
Descriptors:	• military medicine • Air Force	

	• health services • medical personnel • vaccines • detection • active duty • Air Force Facilities • influenza • pathogenic bacteria • research facilities • aerospace medicine • clinical trials • preventive medicine
Background. At home, self-collection of nasal swabs SCNS by subjects during an influenza-like illness ILI, is a convenient alternative to healthcare worker-collected swabs HCWC for PCR detection of respiratory pathogens. Unsupervised SCNS and completion of symptom-based questionnaires benefit surveillance studies by reducing clinic staffing needs, study budgets and increasing the convenience of study participation. In addition, SCNS can reduce delays in swab collection after symptom onset, since subjects do not have to visit a research facility for HCWC. We utilized a cohort of adult US Military Health System MHS beneficiaries enrolled in a flu vaccine effectiveness trial PAIVED between 2019-2020 to evaluate the following Compliance with SCNS and HCWC swabs, Time from symptom onset to SCNS and HCWC collection, and PCR detection of viral respiratory pathogens in SCNC vs. HCWC.	

Halting Covid-19: PANDEMIC - A Predictive Model to Guide Response		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1149423	2021-10-04	Approved for Public Release
Author:	• Boris, Jay • Obenschain, Keith • Boris, David	
Corporate Author:	Naval Research Lab, Washington DC	
Descriptors:	• health services • test methods • governments • national governments • predictive modeling • New York • public health • quarantine • simulations • computer simulations • geographic regions	

	• military research • physics laboratories
PANDEMIC is a new, time-dependent numerical model simulating the infectious spread of an epidemic in a heterogeneous, geographically dispersed region containing millions of people. Each individual can move from place to place and can interact with others while going to meetings i.e. church or sports events, to places of work, to shop, and returning to or staying at home. The model uses an NRL-development, the Monotonic Lagrangian Grid MLG, to track human proximity and calculate infection, viral transmission, illness and death. PANDEMIC was used to test the effects of human behavior patterns, including social distancing and quarantine strategies in the Washington DC Metropolitan region with 6.25 million people. Three 39-week scenarios from March 2020 through December 2020 are considered. These scenarios each had four stages marked by different activities to approximate what took place. Stage 1 was initially open and the covid-19 virus spread unchecked causing surge 1. Stage 2 was a 10 to 12-week lockdown down meant to blunt the first surge. Stage 3 was a limited more or-less open period where surge 2 of the pandemic got started. Stage 4 was also a limited lockdown in all three scenarios with some school opening. Scenario 1approximates what actually happened. Scenario 2 increases the strength of the lockdown measures, reducing the extrapolated national death toll from 325,000 to about 22,000. Scenario 3 further increases the strength of the mitigation measures, as was done in South Korea and Japan, showing what might have been achieved without testing or vaccines.	

Comparison of Next Generation Diagnostic Systems (NGDS) for the Detection of SARS-CoV-2		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151887	2021-09-29	Approved for Public Release
Author:	• Sanchez, Antonio O. • Ochoa, Anna R. • Hall, Sallie L. • Voelker, Chet R. • Mahoney, Rachel E. • McDaniel, Jennifer S. • Blackburn, August • Asin, Susana N. • Yuan, Tony	
Corporate Author:	59th Medical Wing, Lackland AFB, TX	
Descriptors:	• health services • medical personnel • disease outbreaks • microbiology • public health • hygiene • detection	

	• risk analysis • demographic cohorts • diseases and disorders
Over the last year, the COVID-19 pandemic has severely impacted lives of millions of US citizens, including active-duty service members and their beneficiaries. In response, the Department of Defense DoD began enterprise-wide testing at its medical centers, hospitals, and health clinics, which contributed and underscored the scarcity of collection and detection reagents throughout the country. Throughout the expansion of testing, it became apparent that there is need for specific and accurate detection of SARS-CoV-2 due to the overlap of its clinical symptoms with other respiratory pathogens, such as influenza and SARS-CoV-1.	

Comparison of Next Generation Diagnostic Systems (NDGS) for the Detection of SARS-CoV-2 [Poster]		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1146908	2021-09-01	Approved for Public Release
Author:	• Sanchez, Antonio O. • Hall, S. • Ochoa, A. • Voelker, C. • Mahoney, R. • Asin, S. • Yuan, T.	
Corporate Author:	59th Medical Wing, Lackland AFB, TX	
Over the last year, the COVID-19 pandemic has severely impacted lives of millions of US citizens, including active-duty service members and their beneficiaries. In response, the Department of Defense DoD began enterprise-wide testing at its medical centers, hospitals, and health clinics, which contributed and underscored the scarcity of collection and detection reagents throughout the country. Throughout the expansion of testing, it became apparent that there is need for specific and accurate detection of SARS-CoV-2 due to the overlap of its clinical symptoms with other respiratory pathogens, such as influenza and SARS-CoV-1.		

PANDEMIC: To Simulate Infection Spread in a Complex Environment		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148238	2021-09-17	Approved for Public Release
Author:	• Boris, Jay • Obenschain, Keith • Boris, David	
Corporate Author:	Naval Research Lab, Washington DC	

Descriptors:	• health services • monte carlo method • quarantine • databases • public health • test methods • environment • fluid dynamics • physics • New York • physics laboratories • reliability • demography
PANDEMIC is a new, time-dependent simulation model treating the infectious spread of a disease in a complex, geographically varied region containing millions of people. In PANDEMIC, each person in the region moves from place to place and interacts with others they meet while commuting to work, going to meetings i.e. church and other events, to shop or school, and returning to or remaining at home. This model takes advantage of parallel computing using an NRL-developed algorithm called the Monotonic Lagrangian Grid MLG to keep track of who is close to whom, as the people follow their usual routines. This model allows what if tests of different personal and societal public health behaviors and various mitigation strategies to compare their impact and effectiveness. The goal of this research is to predict in greater detail the dynamics of mitigating the current covid-19 pandemic while developing more efficient algorithms and computational techniques using new computer hardware designs. PANDEMIC simulations are presented predicting the three covid-19 infection surges observed through January 2021. Different levels of testing to mitigate the catastrophic third surge are compared. Another prototype study, illustrating how the model can be used for hypothesis testing, is also reported. It evaluates the impact of largely unmasked super-spreader events showing how each such gathering ultimately increases the number of covid-19 related deaths by hundreds.	

Genomic Surveillance of SARS-CoV-2		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1145114	2021-08-01	Approved for Public Release
Author:	• Nazario-Toole, Ashley • Xia, Hui • Nguyen, Holly • Gibbons, Thomas F	
Corporate Author:	59th Medical Wing	

COVID-19 Case and Contact Investigation in an Office Workspace		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104672	2020-07-17	Approved for Public Release
Author:	• Hall, Matthew T. • Bui, Han Q. • Rowe, John • Do, Tai A.	
Corporate Author:	Bureau of Medicine and Surgery, Falls Church, VA	
Descriptors:	• infection control • quarantine • public health • disinfection • office buildings • exposure • signs and symptoms • cleaning • risk • infectious disease transmission	

This investigation report describes a case of COVID-19 in a combined military and civilian office workspace and the contact investigation and mitigation efforts that followed. This office space included an embedded public health officer who was able to conduct the contact investigation and advise on the outbreak response. Over a 3-day period, the index case unintentionally exposed 150 coworkers to SARS-CoV-2 through participation in carpools, conferences, and small meetings. Of these exposures 37 were considered medium risk at the time and 113 were considered low risk. A total of 5 contacts reported COVID-like-symptoms at the time of the investigation and another 5 developed symptoms during the14-day quarantine period and all were directed to self-isolate. None of the contacts required hospitalization and all the symptomatic contacts tested negative for SARS-CoV-2. With the advice and aid of the embedded public health officer, the office authorized telework, conducted thorough cleaning of spaces, distributed informative messaging, conducted virtual question-and-answer forums, and evaluated outbreak policies. This report demonstrates that the close integration of public health and office management can lead to rapid identification of those at risk of infection and implementation of mitigation and control efforts to stop the spread of disease.

Transparency through Complex Interdependence: Vietnam's Surveillance and Reporting of Emerging Infectious Diseases in the Twenty-First Century		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1150822	2021-06-01	Approved for Public Release
Author:	Behrmann, John S.	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	• disease outbreaks • international relations • medical personnel • health services • international organizations • public health • governments • national governments • case studies • hygiene • literature surveys • national security • quarantine	

Why has Vietnam, an authoritarian state, pursued a generally collaborative and transparent policy of emerging infectious disease surveillance and reporting during the last two decades This thesis seeks to add both depth and breadth to this puzzle by analyzing Vietnam's surveillance and reporting during SARS, H5N1, H1N1, and COVID-19 against the theory of complex interdependence as the causal agent. Despite an exception during its initial H5N1 outbreak, Vietnam's surveillance and reporting during these case studies have been largely consistent in sharing epidemiological information and integrating international entities into the structure of this effort. Additionally, this behavior has accompanied the country's deepening integration into the broader global economic and political order. Ultimately, Vietnam's transparency and international cooperativeness during these four emerging infectious disease out breaks show consistency with the internationally enmeshed tenets of complex interdependence. These findings also suggest that the country's deliberate effort to develop as a highly integrated global actor, rather than the authoritarian nature of its government, is largely determinant in driving its contemporary emerging infectious disease surveillance and reporting.

Privacy Risk Assessment of a DON Digital Contact Tracing System Using the NIST Privacy Framework		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1150893	2021-06-01	Approved for Public Release
Author:	Carter, Thomas E.	
Corporate Author:	Naval Postgraduate School, Monterey, CA	
Descriptors:	• cybersecurity • information systems • personnel management • big data • data management • information security • network science • public health • artificial intelligence • business administration • computer science • data sets • health services • machine learning	
COVID-19 has impacted the DONs readiness and ability to operate effectively, and this presents a potential security risk to the U.S. population. In order to allow employees to return to their normal working routines and prevent the spread of COVID-19, the DON began to procure and test a Bluetooth-based contact tracing system in 2020. This research explores the privacy considerations of a digital contact tracing system that was being procured by the DON, and it does so by applying the National Institute of Standards and Technology NIST Privacy Framework which was released in January 2020. We are not only able to provide recommendations about the privacy of the contact tracing system, but we are also able to assess the privacy framework as a privacy risk management tool. We provide a privacy threat model of the system by analyzing the data path of the contact tracing system. We also apply the NIST Privacy Framework to our model of the system, and we determine that the framework is useful for risk identification but does very little to contribute to assessing the impact or likelihood of privacy risks. The threat modeling also reveals that the DON needs to focus more on disassociability of data sets when considering the privacy risks of the contact tracing system, and we recommend that the DON begin conducting privacy testing on systems that collect PII. Finally, we recommend combining the NIST Cybersecurity and Privacy Frameworks in order to streamline the assessment process.		

SARS-COV-2 Dissemination Using United States County Adjacencies		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151225	2021-06-01	Approved for Public Release

Author:	Wren, David M.
Corporate Author:	Naval Postgraduate School, Monterey, CA
Descriptors:	• geography • health services • network science • information science • medical personnel • data mining • computational science • data science • information processing • quarantine • agent-based simulations • hygiene • mathematical models

Currently, severe acute respiratory syndrome coronavirus 2 SARS-CoV-2 transmission is increasing amongst the world's population at an alarming rate. Reducing the spread of SARS-CoV-2 is paramount for public health officials as they seek to effectively manage resources and potential population control measures such as social distancing and quarantine. By analyzing the United States county network structure, one can model and interdict potential higher infection areas. County officials can provide targeted information, preparedness training, and increased testing in these areas. While these approaches may provide adequate countermeasures for localized areas, they are inadequate for the holistic United States. We solve this problem by collecting data on coronavirus-19 COVID-19 infections and deaths from the Center for Disease Control and Prevention and a network adjacency structure from the United States Census Bureau. Generalized network autoregressive GNAR time series models have been proposed as an efficient learning algorithm for networked datasets. This thesis fuses network science and operations research techniques to univariately model COVID-19 cases, deaths, and current survivors across the United States county network structure.

Questioning COVID-19 Surface Stability and Fomite Spreading in Three Aeromedical Cases: A Case Series		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1118384	2020-11-01	Approved for Public Release
Author:	• Horoho, Sean • Musik, Stephen • Bryant, David • Brooks, William • Porter, Ian M	
Corporate Author:	Navy Medicine Support Command, Jacksonville, FL	
Descriptors:	• chain reactions	

	• active duty • diseases and disorders • ships • survival equipment • viral pneumonia • governments • Navy • stainless steel • Air Force • disease outbreaks • mers cov • quarantine • military medicine • medical personnel
It is well established that coronavirus disease 2019 is primarily transmitted through respiratory droplets, and there is mounting research speculation that it may also be transmitted via fomites. Several studies have shown that the virus can persist on both porous and nonporous surfaces for hours to days, depending upon the material. This article examines three cases of polymerase chain reaction–proven severe acute respiratory syndrome coronavirus 2 infection with several additional individuals meeting CDC close contact criteria. In 1 case, 195 downstream contacts were all tested to prevent a mass outbreak in a deployment posture. Analysis of these contacts yielded only a single positive test, which could be reasonably ascribed to respiratory droplet transmission. While these cases and their contacts ultimately represent a small sample size, we suggest fomite spread may not be a significant means of transmission for severe acute respiratory syndrome coronavirus 2 in real-world operational scenarios.	

The Effect of Arrival Quarantine on Subsequent COVID-19 Testing in a Cohort of Military Basic Trainees		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1111321	2020-10-01	Approved for Public Release
Author:	• Marcus, Joseph E. • Frankel, Dianne • Pawlak, Mary • Casey, Theresa • Enriquez, Erin • Yun, Heather	
Corporate Author:	59th Medical Wing, Lackland, TX	
Descriptors:	• Air Force • pain • quarantine	

	• internal medicine • military training • training • risk factors • statistical analysis • diseases and disorders • intervention • governments • diarrhea • inclusions • medical specialties • public health • signs and symptoms
Background: The COVID-19 pandemic has been associated with significant spread in congregate settings and various forms of non-pharmaceutical interventions (NPI) have been implemented to prevent spread. Basic Military Training at Joint Base-San Antonio is the entrance to the US Air Force and has been associated with respiratory outbreaks in the past. A two-week arrival quarantine was implemented in March 2020. Effects on subsequent testing for COVID-19 after an arrival quarantine is unknown. Methods The first four weekly cohorts of trainees who underwent an arrival quarantine between March 16-April 13 were monitored during their 7 week training for COVID-19 symptoms. Symptoms, medical testing, and days removed from training were collected on every patient with possible COVID-19 symptoms including cough, shortness of breath, or fever. Testing during the two-week arrival quarantine were compared to the subsequent five weeks of training. Nominal variables were compared by chi squared or Fisher's exact test as appropriate. Continuous variables were compared by Mann-Whitney U Test.	

Development of Highly Sensitive Goggle for Fluorescence-Based Detection of Middle East Respiratory Syndrome Coronavirus (MERS CoV) and Other Pathogens		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1116293	2020-08-01	Approved for Public Release
Author:	• Caballero, Manuel Y. • Liu, Yang • Hua, Tho	
Corporate Author:	59th Medical Wing, Lackland AFB, TX	
Descriptors:	• light sources • graphical user interface • Middle East • engineering • governments • liquid crystal displays	

	• operating systems • patents • wearable technology • background noise • detection • display systems
In this project, a fluorescence-sensitive goggle prototype was developed at the University of Akron with potential field applicability in detection and identification of viral and bacterial pathogens. The goggle prototype is a wearable device that has two lenses for capturing 3D stereoscopic images. It also has video-recording capability. Further, an especially important feature of the goggle is that it can transmit the information back to a computer for detailed analysis. At the Center for Molecular Detection CAMD, our work focused on testing and evaluation of the goggles fluorescence detection capability. To do that, we devised an in vitro fluorescence-linked immunosorbent assay FLISA. For this assay, we used purified spike protein of Middle East Respiratory Syndrome Coronavirus MERS-CoV and several anti-spike protein polyclonal and monoclonal antibodies. The fluorescent dye Alexa Fluorregistered trademark 647 conjugated to secondary antibodies was used as the fluorophore. For comparison, the fluorescence signals were also read with a BioTek plate reader. The goggle prototype was able to detect fluorescence signals with detection limit of 625 ngmL of the Alexa Fluorregistered trademark 647 goat anti-rabbit IgG in a 96-well plate format. For the detection of purified MERS-CoV spike protein, samples with the spike protein can be distinguished from samples without the spike protein. However, the fluorescence detection limit was significantly lower in comparison to the fluorescence detection limit of the BioTek plate reader in 96-well plate format. The software for the goggle prototype was easy to use and offered several options to improve the quality of the capture images and the detection limit of the fluorescence signal.	

COVID-19 Case and Contact Investigation in an Office Workspace		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1104672	2020-07-17	Approved for Public Release
Author:	• Hall, Matthew T. • Bui, Han Q. • Rowe, John • Do, Tai A.	
Corporate Author:	Bureau of Medicine and Surgery, Falls Church, VA	
Descriptors:	• infection control • quarantine • public health • disinfection • office buildings • exposure	

	• signs and symptoms • cleaning • risk • infectious disease transmission
This investigation report describes a case of COVID-19 in a combined military and civilian office workspace and the contact investigation and mitigation efforts that followed. This office space included an embedded public health officer who was able to conduct the contact investigation and advise on the outbreak response. Over a 3-day period, the index case unintentionally exposed 150 coworkers to SARS-CoV-2 through participation in carpools, conferences, and small meetings. Of these exposures 37 were considered medium risk at the time and 113 were considered low risk. A total of 5 contacts reported COVID-like-symptoms at the time of the investigation and another 5 developed symptoms during the14-day quarantine period and all were directed to self-isolate. None of the contacts required hospitalization and all the symptomatic contacts tested negative for SARS-CoV-2. With the advice and aid of the embedded public health officer, the office authorized telework, conducted thorough cleaning of spaces, distributed informative messaging, conducted virtual question-and-answer forums, and evaluated outbreak policies. This report demonstrates that the close integration of public health and office management can lead to rapid identification of those at risk of infection and implementation of mitigation and control efforts to stop the spread of disease.	

COVID-19 Monitoring and Response Among US Air Force Basic Military Trainees		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1111292	2020-04-01	Approved for Public Release
Author:	• Marcus, Joseph • Frankel, J. E. • Pawlek, D. N.	
Corporate Author:	59th Medical Unit, Lackland AFB, TX	
Descriptors:	• Air Force • quarantine • health services • medical personnel • public health • trainees • training • antiviral agents • disease outbreaks • diseases and disorders • intervention • military training • anti-infective agents	

Epidemiology of COVID-19 response at JBSA-Lackland during COVID. Effect of Arrival Quarantine on Subsequent COVID-19 Testing. Perspectives as a trainee doing COVID-19 research. Background on USAF Basic Military Training. ~ 40,000 trainees year at Joint Base San Antonio-Lackland JBSA. ~800 trainees arrive each week. 75 percent male with most in late teens or early 20s. Pre-health screening for underlying medical conditions. Training involves classrooms, small group activities, and field exercises. USAF BMT Communal Living. Cohort of 50 trainees. Sleeping quarters. Activities. History of communicable diseases. Head-to-toe bunks. Regular cleaning of shared equipment. Active health surveillance. Diagnostic Testing and Isolation. All trainees were screened by training instructors and positive responses were evaluated by medical staff. SARS-CoV-2 tests Nasal swab, RT-PCR PCR. Initial testing for self-reported ill patients with symptoms and recent close contact or travel from high-transmission area. March 1-15 2 patients tested. March 16 Symptoms only requirement. Symptomatic persons were isolated in single rooms and monitored allowed to return 7 days after symptom onset and greater than 3 days post-fever.

COVID-19 Testing: Key Issues		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1146813	2020-04-23	Approved for Public Release
Author:	Sarata, Amanda K.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
The COVID-19 pandemic is affecting communities throughout the United States, with the country reporting the highest number of cases and deaths from the disease globally. Containment and mitigation efforts by federal, state, and local governments have been undertaken to flatten the curve - that is, to slow widespread transmission that could overwhelm the nation's health care system.		

Stopping COVID-19: Short-Term Actions for Long-Term Impact		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1137496	2020-03-18	Approved for Public Release
Corporate Author:	MITRE Corp, Mclean, VA	
This memo is put together by MITREs infectious disease analytics team, which projected the trajectory and consequences of the Ebola outbreak, as well as other epidemiological events. We base our recommendations on quantitative analysis and modeling developed for prior epidemics, yet tailored and advanced for COVID-19.		

National Biodefense Strategy: Opportunities and Challenges with Early Implementation		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1098879	2020-03-11	Approved for Public Release

Author:	• Currie, Chris P. • Denigan-Macauley, Mary
Corporate Author:	Government Accountability Office, Washington DC
Descriptors:	• national security • governments • environmental protection • homeland security • national governments • public health • security • diseases and disorders • disease outbreaks • risk management • congress

We are pleased to be here today to discuss our recently issued work on the National Biodefense Strategy. Catastrophic biological threats highlight the inextricable link between security and public health concerns. These threats whether naturally-occurring, intentional, or accidental have the potential to cause loss of life and sustained damage to the economy, societal stability, and global security. The vast and evolving biological threat landscape includes threats of naturally-occurring infectious diseases, bioterrorism, and safety and security lapses at facilities that house biological threat agents. For example, the unpredictable nature of naturally-occurring disease, such as the novel coronavirus COVID-19, poses a threat to humans. As of March 5, 2020, COVID-19 has spread from China to nearly 80 countries, including the United States, which has over 150 cases and nearly a dozen deaths associated with the virus. This novel virus poses a public health and economic threat, and may eventually be declared a pandemic, as seen with severe acute respiratory syndrome SARS in 2003. Infectious diseases, such as coronaviruses, can be transmissible from animals to humans, demonstrating how our relationships with animals may increase the risk of disease transmission among people, pets, livestock, and wildlife.

Controlling the Spread of Contagious Disease in an Operational Environment		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1099456	2020-02-01	Approved for Public Release
Author:	• Burr, Julia K • Cubeta,Robert L • LaViolet,Lucas A • Oxford,Sean M	

Corporate Author:	Institute for Defense Analyses, Alexandria, VA
Descriptors:	• disease outbreaks • military operations • medical countermeasures • quarantine • public health • health services • personal protective equipment • situational awareness
Should an operationally significant outbreak of infectious disease occur during an ongoing military operation, US and Joint Force Commanders may consider a variety of measures to limit the spread of the outbreak and minimize its impact on operations and on the health of the force. The selection of any measure or set of measures will depend on a variety of factors, including the type of operation, the availability and effectiveness of outbreak control measures, and the potential operational degradation due to outbreak controls. This paper assesses the potential costs and benefits of a variety of outbreak control measures, including medical countermeasures and restrictions of movement, and considers the influence of several operational challenges and disease characteristics on the outcome. From this assessment, the paper derives a set of generalized rules of thumb to support commanders in selecting outbreak controls.	

Project BioShield: Authorities, Appropriations, Acquisitions, and Issues for Congress		
Accession Number:	**Report Date:**	**Access Restrictions:**
ADA524995	2010-07-15	Approved for Public Release
Author:	Gottron, Frank	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• legislation • terrorism • antiviral agents • anthrax • variola virus • countermeasures • collective protection • emergencies • botulism	
Many potential chemical, biological, radiological, and nuclear CBRN terrorism agents lack available medical countermeasures. In 2003, President Bush proposed Project BioShield to address this need. The Project BioShield Act became law in July 2004 P.L. 108-276. This law has three main provisions 1 relaxing regulatory requirements for some CBRN terrorism-		

related spending, including hiring personnel and awarding research grants 2 guaranteeing a federal government market for new CBRN medical countermeasures and 3 permitting emergency use of unapproved countermeasures. The Department of Health and Human Services HHS has used each of these authorities. The HHS used expedited review authorities to approve contracts and grants related to CBRN countermeasure research and development. The HHS used the authority to guarantee a government market to obligate approximately 2 billion to acquire countermeasures against anthrax, botulism, radiation, and smallpox. The HHS has also employed the emergency use authority several times, including allowing young children with H1N1 swine influenza to receive specific antiviral drugs.

Vaccines

Prevaccination Against COVID-19 Among Air Force Military Recruits		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151854	2021-11-01	Approved for Public Release
Corporate Author:	59th Medical Wing, Lackland AFB, TX	
Descriptors:	• Air Force • Air Force Facilities • institutional review board • governments • materials • surveillance • disease outbreaks • national governments	
Air Force Basic Military Trainees began arriving to Lackland Air Force Base either partially or fully vaccinated against COVID-19 in the beginning of 2021. During the defined 15-week time frame March2-June 15, 600-900 trainees entered BMT on a weekly basis. The rate of trainees, who arrived to BMT either partially or fully vaccinated, increased on a weekly basis in 12 out of the 15 weeks. The Pfizer and Moderna vaccines were the predominate vaccines throughout this period. The majority of trainees arrived to BMT fully vaccinated against COVID-19 range 58-98 per week.		

Domestic Funding for COVID-19 Vaccines: An Overview		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148932	2021-09-29	Approved for Public Release
Author:	Sekar, Kavya	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• health services • congress • medical personnel • public health • emergencies	

	• disease outbreaks • hygiene • minority groups • diseases and disorders • medical countermeasures • public health emergencies

Sequencing SARS-CoV-2 from Antigen Tests		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1145389	2021-08-01	Approved for Public Release
Author:	• Nazario-Toole, Ashley • Nguyen, Holly M • Xia, Hui • Frankel, Dianne N • Kieffer, John W • Gibbons, Thomas F	
Corporate Author:	59th Medical Wing, Joint Base San 10 Antonio-Lackland, TX	
Genomic surveillance empowers agile responses to SARS-CoV-2 by enabling scientists and public health analysts to issue recommendations aimed at slowing transmission, prioritizing contact tracing, and building a robust genomic sequencing surveillance strategy. Since the start of the pandemic, real time RT-PCR diagnostic testing from upper respiratory specimens, such as nasopharyngeal (NP) swabs, has been the standard. Moreover, respiratory samples in viral transport media are the ideal specimen for SARS-CoV-2 whole-genome sequencing (WGS). In early 2021, many clinicians transitioned to antigen-based SARS-CoV-2 detection tests, which use anterior nasal swabs for SARS-CoV-2 antigen detection. Despite this shift in testing methods, the need for whole-genome sequence surveillance remains. Thus, we developed a workflow for whole-genome sequencing with antigen test-derived swabs as an input rather than nasopharyngeal swabs. In this study, we use excess clinical specimens processed using the BinaxNOW™ COVID-19 Ag Card. We demonstrate that whole-genome sequencing from antigen tests is feasible and yields similar results from RT-PCR-based assays utilizing a swab in viral transport media.		

COVID-19 Vaccination: Selected U.S. Data Sources		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148929	2021-03-16	Approved for Public Release
Author:	• Cornell, Ada S. • Napili, Angela	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• health services • congress	

	• data analysis • New York • geography • surveys • universities • vaccination
The sources below can help congressional staff track the progress of the U.S. COVID-19 vaccination campaign at the national, state, and local levels. Sources were selected for having commonly cited and frequently requested data. This list is not intended to be comprehensive. Additional sources may be added in future updates. Because different resources use different methodologies, readers should check websites notes, definitions, and caveats. Readers should also use caution when comparing data across sources or geographies. For assistance in interpreting or analyzing these data, congressional staff should contact CRS 202-707-5700, or place a request at the CRS website.	

Processes and Best Practices from the US Navy Vaccination Center at Bloch Arena		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1151418	2021-03-01	Approved for Public Release
Author:	Dickey, Bradley F.	
Corporate Author:	Center for Naval Analyses, Arlington, VA	
Descriptors:	• medical personnel • engineering • military medicine • training • computer access control • flow rate • governments • vaccination	
The U.S. Navy vaccination center at the Bloch Arena on Joint Base Pearl Harbor-Hickam was observed and analyzed for processes and flow rates. We estimate that the current single shift of 60 staff working medical and administrative processes can administer up to 2,500 vaccinations each day. Increased demand will require a second shift. We document best practices, including facility choice, a well-constructed flow pattern, queue formation engineering, staff task specialization, personnel cross-training, overstaffing nodes, and constant improvement and innovation. Our only current substantive recommendation is to implement a work-day maximum for the staff, similar to aviators flight-day, to guard against burn-out and fatigue-related errors.		

COVID-19 Vaccine: Financing for Its Administration		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148085	2021-02-19	Approved for Public Release
Author:	• Baumrucker, Evelyne P. • Forsberg, Vanessa C. • Hahn, Jim • Heisler, Elayne J. • Lister, Sarah A.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• health services • congress • public health • law • emergencies • governments • medicare • public health emergencies • disease outbreaks • diseases and disorders • District of Columbia • economic security • hygiene • national governments • vaccination	
A U.S. COVID-19 vaccination campaign is underway. For this effort, all vaccines and some supplies for their administration to patients have been purchased by the federal government, with appropriations provided for this purpose. These are available at no cost to providers and patients. When the vaccine delivery approach allows for individual patient transactions, providers may seek reimbursement from available payers for their costs to administer the vaccines, including the costs of their time, vaccine storage, recordkeeping, and additional supplies. In general, by law and regulation, patients should not be charged for the COVID-19 vaccine or the costs of its administration during the campaign. There may be exceptions when the vaccine is administered during a visit in which other services - such as a check-up for a chronic condition - are also furnished, and a visit fee unrelated to vaccine administration may be billed. This Insight explores the provision of COVID-19 vaccines and payment for their administration, where applicable, from the perspectives of patients, providers, and public and private payers. It does not discuss 1) federal entities that provide direct health care services, such as the Departments of Defense and Veterans Affairs 2) vaccination sites that		

are fully financed and do not involve individual patient transactions or 3) payment policies that may apply after the initial vaccination campaign in spring 2021.

COVID-19 Vaccine Doses: Selected Data Sources on Allocation, Distribution, and Administration		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1148095	2021-02-10	Approved for Public Release
Author:	Cornell, Ada	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	
Descriptors:	• health services • congress • New York • data analysis • governments • vaccination • veterans health • visualizations • pharmacies • universities • geography • law • copyrights	
The selected sources below can help congressional staff track the progress of the U.S. COVID-19 vaccination campaign at the national, state, and local levels. Sources were selected for having commonly cited and frequently requested data. This is not intended to be a comprehensive source list. Additional sources may be added in future updates. Because different resources use different methodologies, readers should check websites notes, definitions, and caveats. Readers should also use caution when comparing data across sources or geographies. For assistance in interpreting or analyzing these data, congressional staff should contact CRS 202-707-5700, or place a request at the CRS website. The Centers for Disease Control and Prevention's (CDC) COVID-19 Vaccine website can assist constituents with vaccine questions, including How Do I Get a Vaccine.		

Operation Warp Speed: Accelerated COVID-19 Vaccine Development Status and Efforts to Address Manufacturing Challenges		
Accession Number:	**Report Date:**	**Access Restrictions:**

AD1147991	2021-02-01	Approved for Public Release
Author:	• Howard, Karen L. • Wright, Candice N.	
Corporate Author:	Government Accountability Office, Washington DC	
Descriptors:	• health services • medical personnel • congress • respiratory tract diseases • proteins • public health • vaccines • biological products • House of Representatives • immune system • lymphocytes • disease outbreaks	

As of February 5, 2021, the U.S. had over 26 million cumulative reported cases of COVID-19 and about 449,020 reported deaths, according to the Centers for Disease Control and Prevention. The country also continues to experience serious economic repercussions, with the unemployment rate and number of unemployed in January 2021 at nearly twice their prepandemic levels in February 2020. In May 2020, OWS was launched and included a goal of producing 300 million doses of safe and effective COVID-19 vaccines with initial doses available by January 2021. Although FDA has authorized two vaccines for emergency use, OWS has not yet met its production goal. Such vaccines are crucial to mitigate the public health and economic impacts of the pandemic. GAO was asked to review OWS vaccine development efforts. This report examines 1 the characteristics and status of the OWS vaccines, 2 how developmental processes have been adapted to meet OWS timelines, and 3 the challenges that companies have faced with scaling up manufacturing and the steps they are taking to address those challenges. GAO administered a questionnaire based on HHSs medical countermeasures TRL criteria to the six OWS vaccine companies to evaluate the COVID-19 vaccine development processes. GAO also collected and reviewed supporting documentation on vaccine development and conducted interviews with representatives from each of the companies on vaccine development and manufacturing.

COVID-19 Critical Vaccine Distribution, Supply Chain, Program Integrity, and Other Challenges Require Focused Federal Attention		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1147464	2021-01-01	Approved for Public Release

Author:	Dodaro, Gene L.
Corporate Author:	Government Accountability Office, Washington DC
Descriptors:	• health services • medical personnel • geography • business administration • personnel management • employment • government procurement • congress • hygiene • interagency coordination • supply chain integrity • management personnel • department of homeland security • intellectual property • national security • disease outbreaks

As of January 15, 2021, the U.S. had about 23 million cumulative reported cases of COVID-19 and more than 387,000 reported deaths, according to the Centers for Disease Control and Prevention. The country also continues to experience serious economic repercussions. Four relief laws, including the CARES Act, were enacted as of November 2020 to provide appropriations to address the public health and economic threats posed by COVID-19. As of November 30, 2020, of the 2.7 trillion appropriated by these four laws, the federal government had obligated a total of 1.9 trillion and expended 1.7 trillion of the COVID-19 relief funds, as reported by federal agencies. In December 2020, the Consolidated Appropriations Act, 2021, provided additional federal assistance for the ongoing response and recovery. The CARES Act includes a provision for GAO to report on its ongoing monitoring and oversight efforts related to the COVID-19 pandemic. This report examines the federal governments continued efforts to respond to and recover from the COVID-19 pandemic. GAO reviewed data, documents, and guidance from federal agencies about their activities and interviewed federal and state officials and stakeholders. GAO completed its audit work on January 15, 2021.

Funding for COVID-19 Vaccines: An Overview		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1146331	2020-12-15	Approved for Public Release

Author:	Sekar, Kavya
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC

On December 11, 2020, the U.S. Food and Drug Administration (FDA) issued an Emergency Use Authorization (EUA) for Pfizer/BioNTech's Coronavirus Disease 2019 (COVID-19) vaccine. Several other COVID-19 vaccines are currently in clinical trials or under review; additional vaccines may become available by the end of 2020. Moderna has announced preliminary Phase 3 results and is under EUA consideration. As a part of Operation Warp Speed (OWS)—the Trump Administration's COVID-19 medical countermeasure initiative led by the Department of Health and Human Services (HHS) and the Department of Defense (DOD)—the U.S. government has entered into several contracts with vaccine manufacturers to purchase hundreds of millions of doses (including Pfizer/BioNTech and Moderna's vaccine) and has also supported manufacturing and procurement of related supplies. Other OWS vaccine efforts include planning and implementation of a nationwide immunization program, public awareness, and vaccine data tracking, among others

Operation Warp Speed Contracts for COVID-19 Vaccines and Ancillary Vaccination Materials		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1146337	2020-12-22	Approved for Public Release
Author:	Siddalingaiah, Simi V.	
Corporate Author:	Congressional Research Service, Library of Congress, Washington DC	

Operation Warp Speed OWS is an interagency partnership between the Department of Health and Human Services HHS and the Department of Defense DOD that coordinates federal efforts to accelerate the development, acquisition, and distribution of COVID-19 medical countermeasures. Collaborating HHS components include the Centers for Disease Control and Prevention CDC, the National Institutes of Health NIH, and the Biomedical Advanced Research and Development Authority BARDA. Although the stated goals of OWS include therapeutics and diagnostics, most of the money awarded to date has focused on vaccines. This Insight summarizes OWSs vaccine-related contracts, including those for ancillary vaccination materials e.g., needles and vials.

COVID-19: Federal Efforts Accelerate Vaccine and Therapeutic Development, but More Transparency Needed on Emergency Use Authorizations		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1149375	2020-11-01	Approved for Public Release

Author:	• Denigan-Macauley, Mary • Hundrup, Alyssa M.
Corporate Author:	United States Government Accountability Office, Washington DC
Descriptors:	• health services • medical personnel • congress • minority groups • government procurement • intellectual property • infectious diseases • national governments • public health • therapy • governments • House of Representatives

The U.S. had about 10.3 million cumulative reported cases of COVID-19 and about 224,000 reported deaths as of November 12, 2020. Given this catastrophic loss of life as well as the pandemics effects on the U.S. economy, effective and safe vaccines and therapeutics are more important than ever. The CARES Act includes a provision for GAO to report on its ongoing monitoring and oversight efforts related to the COVID-19 pandemic. This report examines, 1 efforts of Operation Warp Speed to accelerate COVID-19vaccine and therapeutic development and 2 FDAs use of EUAs for COVID-19 therapeutics and vaccines, among other objectives. GAO reviewed federal laws and agency documents, including HHS and DOD information on vaccine and therapeutic development and EUAs as of November 2020. GAO interviewed or received written responses from HHS and DOD officials, and interviewed representatives from vaccine developers and manufacturers, as well as select public health stakeholders and provider groups covering a range of provider types.

COVID-19, Federal Efforts Accelerate Vaccine and Therapeutic Development, but More Transparency Needed on Emergency Use Authorizations		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1149518	2020-11-01	Approved for Public Release
Corporate Author:	Government Accountability Office, Washington DC	
Descriptors:	• health services • medical personnel • congress • minority groups • government procurement	

	• intellectual property • infectious diseases • national governments • public health • therapy • governments • House of Representatives
Through Operation Warp Speed—a partnership between the Department of Health and Human Services (HHS) and the Department of Defense (DOD)—the federal government is accelerating efforts to develop vaccines and therapeutics for COVID-19. A typical vaccine development process can take approximately 10 years or longer, but efforts under Operation Warp Speed seek to greatly accelerate this process by completing key steps simultaneously (see figure). As of October 15, 2020, Operation Warp Speed publicly announced financial support for the development or manufacturing of six COVID-19 vaccine candidates totaling more than $10 billion in obligations. It has also announced financial support for the development of therapeutics, such as a $450 million award to manufacture a monoclonal antibody treatment (a treatment that uses laboratory-made antibodies, which also may be able to serve as a prevention option).	

MERS-CoV and H7N9 Influenza Assay Development on NGDX		
Accession Number:	**Report Date:**	**Access Restrictions:**
AD1068835	2018-07-01	Approved for Public Release
Author:	• Caballero, Manuel • Armstrong-Spenrath, Laquita	
Corporate Author:	Center for Advanced Molecular Detection JBSA-Lackland	
Descriptors:	• public health • gel electrophoresis • gene expression • portable equipment • lightweight • biological detection • threats • reagents • assays • influenza	
Deadly infectious diseases pose a prevalent danger to war fighters and warrior medics in remote, hostile areas. Infectious agents inevitably hinder the war fighter's duty performance, even potentially cause mission failures. Therefore a crucial military need is to acquire the capabilities to rapidly detect the threat agents, and to expeditiously devise strategies to counter the threats. The Biomeme two3 Biomeme, Inc., Philadelphia, PA is a light 1.2 lb.,		

hand-held, field-deployable real-time polymerase chain reaction PCR device that could meet these needs. The device is coupled to an iPhone with unique software for data analysis and transmission to intended recipients. This work reports a comparative research testing and evaluation of this system, focusing on detection of the Middle East Respiratory Syndrome Coronavirus MERS-CoV and Influenza A virus H7N9 for this assessment. Three Biomeme two3 instruments were purchased for this work. The reagents specifically designed and set in the appropriate format for Biomeme two3 and the target templates were also purchased from the manufacturer of the instrument. For MERS-CoV, the detection targets were an orf1a segment and a segment upstream of gene E termed upE. For H7N9, the target amplicons were in the H7 and N9 genes. The instrument performance was evaluated for template copy numbers that varied from 50 to 500,000 per reaction.

Author Index

A

Abramowitz, Amy, 89
Accardi, Russell, 38
Adgie, Mary K, 49
Adhikari, A., 18
Ahmed, Asim A., 66
Aitichou, Mohamed, 107
Ake, Julie A., 82
Al-Khlaiwi, Thamir, 40
Ambris, Herman A., 29
Amendola, Michael F., 35
April, Michael D, 24
Arana, Allyson A, 23, 25
Armstrong, Adam W, 52
Armstrong-Spenrath, Laquita, 153
Arnett, Sarah, 89
Asin, S., 131
Asin, Susana N., 130
Aussendorf, Paul, 89
Azam, Saif A., 115
Aziz, Shazia, 29

B

Bailey, Charles C., 66
Balzli, C., 17
Bannister, Roy, 58
Baraskaus, Ona, 58
Barsoumian, Alice E., 28
Bauer, Christian, 44
Baumrucker, Evelyne P., 102, 147
Bausch, Daniel G., 108
Bavari, Sina, 58
Baxi, Sanjiv M., 29
Bebarta, Vikhyat S., 25
Bebo, Natasha L., 24
Becker, Michelle M, 66
Behdad, Amir, 31
Behrmann, John S., 134
Bekoe, Dorina A., 53
Bender, Geoffrey S, 114
Bergman, Michael S., 124
Berk, Kimberly L, 54, 103
Bhatia, A., 41
Birger, Ruthie, 15
Bishop, Michael, 27
Blackburn, August, 130
Blackwell, Jeffrey K., 110
Blackwell, Rebecca S., 55
Blodgett, Austin, 74
Blum, Steven M, 54, 104
Bonial, Claire, 60, 68, 74
Boris, David, 129, 131
Boris, Jay, 129, 131
Boulter, Kathleen, 69
Brahmbhatt, Trupti, 50
Branche,Angela R., 28
Branco, Luis M., 108
Brass, Abraham L., 66
Brett-Major, David M, 13, 116
Bridwell, Rachel, 39
Broadhurst, M. J., 13, 117
Bronaugh, Stephen, 32
Brooks, William, 136
Brown, T. F., 43
Brown, TeAnne L., 20
Brulois, Kevin F., 40
Bryant, David, 136
Bryden, Wayne, 38
Buatti, Joseph, 27
Buckley, Patricia E, 54, 104
Bui, Han Q., 133, 139
Burgess, Timothy H, 52, 127, 128
Burr, Julia K, 142
Bushmaker, Trenton, 63
Butkus, Claire, 61
Byrne, Rich, 91

C

Caballero, Manuel, 138, 153
Card, Brittany, 117
Carlson, Krista R, 118
Carlson, Marcia, 89
Carra, Ernest, 58
Carta, Alessandro, 13
Carter, Thomas E., 135
Case, Josiah, 75
Casey, Theresa, 48, 55, 137
Cashman, Kathleen A., 108
Cassell, Gail H., 91
Cassidy, Daniel, 48
Cawcutt, Kelly, 69
Cecire, Michael H., 70, 71
Cetta, Maximilian, 38
Chanda, Sumit K., 26
Chapleau, Richard, 62
Chekmenev, Eduard Y, 24
Chi, Xiaoli, 66
Chiang, Jessica J., 66
Chin, Eric J., 24
Chun, Kwon, 58
Chung, Kevin K., 29, 36

Cieslak, Theodore J, 116
Cihlar, Tomas, 58
Ciorba, Matthew A., 40
Clarke, Michael O., 58
Clowers, A. N., 86, 90, 113
Cohen, Jason, 26
Cohodes, Nina, 81
Coles, Christian L, 127, 128
Collins, Limone, 127, 128
Colombo, Rhonda E., 127, 128
Comito, Devon, 15
Connacher,William, 31
Cooper, Casey W, 21
Cooper, Wayne, 54
Cornell, Ada, 94, 145, 148
Corsten, M., 42
Costin, Kate M., 102
Cote, D., 43
Coughlin, Branden, 26
Crain, Bradford P., 78
Creager, Hannah M, 13, 116
Crown, Kevin, 13, 38
Cubeta,Robert L, 142
Cummings, Kevin, 27
Currie, Chris P., 118, 142
Cutright, Julie E, 23

D

Dahlke, Jacob M, 116
Daly, Sarah, 53, 80
Davar, Kusha, 104
Davenport, Matthew L., 27
Davies, Benjamin, 117
Davis, William T, 23, 25
De Wit, Emmie, 63
Dehgani-Mobaraki, Puya, 43
DeLong, Gerald, 52
Demirjian, Natalie L., 115
Demorest, Kelsey M., 27
Denigan-Macauley, Mary, 118, 142, 152
Denison, Todd, 26
Desalle, Rob, 15
Diamond, Michael S., 40
Dickey, Bradley, 45, 146
Dimitrov, Vihren G., 29
Ding, Siyuan, 40
Distelhorst, Steven, 37
Dittman, James M., 35
Do, Tai A., 133, 139
Dodaro, Gene L, 92, 150
Doerffler, Edward, 58
Dolan, Mathew J., 55
Dong, Lian, 66
Donovan, Andrew E., 34
Dora, Amy V., 104
Dortch, Cassandria, 94
Dougherty, Joseph, 32
Doughty, David C, 60, 68
Downs, Matthew E., 91
Dreizin, E., 18
Dudley, Joseph P., 65
Dugal, AJ, 67
Dunne, William J., 119
Dye, John, 51

E

Ebert, Ernest P., 49
Egar, William T., 94
Eide, Benjamin, 118
Eldabe, S., 41
Else, Daniel H., 71
Emodi, Mark, 69
Encoy, Michael C, 112
Engels, P. T., 42
Enriquez, Erin, 137
Epsi, Nusrat J., 128
Erb, Mikey, 89
Eshelman, Robert E., 27
Estevez Burns, Rosemary, 48

F

Fair, Joseph N., 108
Farke, Jerald D., 69
Feldman, Jeffery M, 110
Fenequito, Robert, 52
Feng, Joy Y., 58
Fernandez, William, 24
Ferro, Philip J., 108
Fey, Paul D, 116
Fields, Brandon K., 115
Fields, Robert, 109
Filip, Ioan, 15
Firth, Jacqueline, 82
Flanagan, Meg L., 65
Flores, Camilo, 89
Fondy, Susan, 27
Forsberg, Vanessa C., 102, 147
Frakes, Michael, 26
Frankel, Dianne, 48, 55, 137, 145
Frankel, J. E., 140
Freier, Nathan, 100
Friend,James, 31
Fries, Anthony C., 128
Frink, Adam, 31
Fritz, Elizabeth A., 63

Fung, K., 43

G

Gaffney, Jonathan M., 94
Gagneten, Sara E., 64
Galanti, Marta, 15
Gallo,Marcy E., 99
Gamble, Amandine, 63
Ganesan, Anuradha, 127, 128
Garcia-Sastre, Adolfo, 106
Geaney, Casey, 127, 128
Geibe, Jesse R, 52
Geiss, Kevin, 56
Geisthoff, Urban W., 44
Gerber, Susan I., 63
Gerstner, Jason, 27
Ghazaryan,Varduhi, 28
Gholamrezanezhad, Ali, 115
Gibbons, Thomas F, 60, 132, 145
Gibbs, Shawn, 69
Gillingham, Bruce L, 52
Giordano, James, 83
Goba, Augustine, 108
Godfrey, Catherine, 82
Goetz, Matthew B., 104
Golin, Rachel, 82
Gomez Castro, Maria F., 39
Gordon, Bruce G, 116
Gorman, Carol, 44, 85
Gottlieb, Michael, 33, 38, 39, 46
Gottron, Frank, 143
Graber, Christopher J., 104
Grant, Gregory D., 123
Greenberg, Harry B., 40
Grinshpun, S. A., 18
Guha, Supratik, 123
Gupta, M., 43
Gutierrez, Victor P, 29

H

Haffner, William H, 36
Hahn, Jim, 102, 147
Halamka, John, 91
Hall, Matthew T., 133, 139
Hall, S., 131
Hall, Sallie L., 130
Hankins, Richard, 69
Hansen, Keith F, 116
Hanson, David, 124
Hantz, Carolyn, 30
Harcourt, Jennifer L., 63
Harnish, David A., 17
Harnish, Delbert, 16
Harrington, Lawrence, 68
Hart, Nina M., 70
Hautefort, Charlotte, 44
Hawkins, Robert J, 52
Heimbuch, Brian, 16, 17, 22, 124, 125
Heisler, Elayne J., 102, 147
Hemphill, Johari J, 79
Hensley, Lisa E ., 63
Herman, Philippe, 44
Herrera, Vicki, 38
Herrera,Vicki L, 13
Hevesi, Sara, 118
Hewlett, Angela L, 116
Hicks, Christopher, 38, 46
Hill, Steven C, 60, 68
Hinkle, Lauren, 69
Hinrichs, Steven H., 20
Hoang, Thanh D., 41
Holbrook, Eric H., 44
Holbrook, Myndi G., 63
Hope, Janiece, 68
Hopkins, Claire, 44
Horoho, Sean, 136
Houskamp, Daniel, 52
Howard, Jeffrey T., 24
Howard, Karen L., 149
Hrncir, David E., 127, 128
Hsieh,Lanny, 28
Hu, Ted, 89
Hua, Tho, 138
Huang, I.-C., 66
Hudson, Taylor A, 74
Huggins, John, 64, 107
Hui, Hon C., 58
Hull, Theresa, 30, 88, 93
Hume, Robert, 100
Hundrup, Alyssa M., 152
Hunninghake, John C., 25
Hurst, Savannah, 67
Husband, Michael, 124

I

Ibrahim, Sofi, 107
Ingersoll, Tom, 126
Inks, Kevin, 53
Isserman, Noah D., 102

J

Jackson, James K., 76
Jacques, Mark, 27
Jahrling, Peter, 64, 107

Jain,Mamta K., 28
Jatt, Lauren P., 104
Jensen, Deanna L, 29
Ji, Peng, 31
Johnson, Daniel W, 116
Johnson, James, 26
Johnson, Mark, 32
Jones, Delwen, 89
Jordan, Robert, 58
June, Carl H., 47

K

Kalil, Andre C, 116
Kalil,Andre C., 27
Kane, Daniel J., 101
Kansagra, Shayri M., 91
Kapp, Lawrence, 100
Karp, Christopher L., 64
Kasper, Matthew R, 52
Kautz, Michelle, 128
Kelly, John D., 29
Kern, Hannah S., 104
Kesavan, Jana, 19
Khalili, S., 42
Khan, Ali S, 116
Khan, Asif A., 113
Kieffer, John W, 48, 145
Kinahan, Sean, 37
Kinney, K., 17
Kinney, Kimberly, 16, 125
Kirschbaum, Joseph W., 120
Kline, Jonathan D., 34
Kline,Susan, 28
Klonoff, David C., 41
Knox, John, 58
Kolker, Abigail F., 102
Konda, Abhiteja, 123
Kortepeter, Mark G, 116
Kost, K. M., 43
Kratochvil, Christopher J, 116
Krause, Heather, 89
Kyusung, Park, 107

L

Lakhani, Karim R, 81
Lalani, Tahaniyat, 127, 128
Lane, Benjamin, 15
Lane, Jason C., 56
Larson, LuAnn, 116
LaViolet,Lucas A, 142
Lawler, James V, 13, 117
Lee, Erica A., 102
Lee, Gary, 58
Lee, K. F., 89
Lee, Lana, 82
Lee, William A., 58
Lee,Daniel E., 31
Lehocky, Chase, 114
Leighton, Terrance J., 65
Lentz, Skyler, 33
Lerman, Kristina, 75
Levy, Deborah A, 116
Lew, Willard, 58
Li, Hsing-Wang, 17
Liang, Stephen Y., 38, 46
Liashek, Matthew D., 84
Liedtke, Eric, 32
Ligon, Chanel, 15
Linder, James, 116
Lisanby, Mark, 62
Lister, Sarah A., 95, 147
Liu, Sheng, 54
Liu, Yang, 138
Liu, Zhuoming, 40
Livada, Alan, 56
Lloyd-Smith, James O., 63
Lo, Michael K., 58
Lobo, C. A., 41
Lofgren, Joanie, 89
Lohman, Kent, 59
Long, Adrianna, 24
Long, Brit, 24, 33, 38, 39, 46
Lookadoo, Rachel E, 117
Lore, Michael B., 20
Lovett, Kaitlin R., 117
Lovine,Nicole M., 28
Lowe, Abigail, 116
Lowe, John J., 14, 69
Lowe, John-Martin J, 117
Lucero, Gabriel, 38
Luetkemeyer,Anne F., 28
Lukin, Stephanie M, 60, 68, 74
Lumley, April, 125
Lumley, April, 17
Luna-Long, Maureen, 89
Luse, Tina, 52
Lye,David C., 28
Lyon, Dina M., 44

M

Mackie, Daniel P., 120
Mackman, Richard L, 58
MacLeod, Heather, 89
Maddry, Joseph K, 23, 25, 51
Mahmassani, Tarek, 89

Mahoney, R., 131
Mahoney, Rachel E., 130
Mainolfi ,James, 122
Manley, Geoffrey T., 44
Marconi,Vincent C., 28
Marcus, Joseph, 28, 55, 137, 140
Markelz, Ana, 127, 128
Martin, Bradley, 50
Matos, Renee I., 36
Matschiner, Alex, 108
Maurer, Diana, 113
Maves, Ryan, 127, 128
Mazzei,William, 31
McCammond, Rosemary L., 73
McCarvel, Brooks, 23
McClenathan, Bruce, 127, 128
McCune, Broc T., 40
McDaniel, Jennifer S., 130
McDonald, Michael, 124
McGarvey, Michael P., 49
McGinnis, Michael B, 52
McInnis, Kathleen J., 101
McLoughlin, Mike, 38
Medcalf, Sharon J, 116
Medellin, Kimberly L., 25
Mehta,Aneesh K., 27
Mei, Yang, 31
Mende, Katrin, 127, 128
Mendez, Bryce H., 102
Menon, Vidya P., 29
Meo, Anusha S., 40
Meo, Sultan A., 40
Merritt,Sidney, 31
Michael,Nelson L., 98
Micheels, Terry, 69
Micher, Jeffrey, 74
Milbourn, Gordon, 96
Miller, Elissa, 53
Minior, Thomas, 82
Modi, Jitendrakumar R., 127, 128
Molles, Jeffrey J., 27
Montgomery, Jay R., 127, 128
Montrief, Tim, 33
Moore, John B., 47
Mora, Alejandra G., 25
Morita, Haruka, 15
Morris, Dylan H., 63
Morwitzer, M. J., 13
Moss, Gregory A., 123
Munster, Vincent J., 63
Musik, Stephen, 136
Myers, Kyle R, 81
Myers, Lee, 115
Mylonas, Anastasios, 77

N

Naik, Rajesh, 56
Napili, Angela, 145
Naughton, Michael J., 56
Nazario-Toole, Ashley, 60, 132, 145
Nelson, Jessie G, 118
Neville, Sean, 58
Ng, Patrick C, 23, 25
Nguyen, Holly, 132
Nguyen, Holly M, 145
Nicholson, Mark A., 80
Nowicki, Jacqueline M, 81
Noyes, Alexander, 49

O

Obenschain, Keith, 129, 131
Ochoa, A., 131
Ochoa, Anna R., 130
O'Guinn, Monica, 107
Okonak, Jonathan M., 84
Olinger, Gene, 59
Olins, Eric, 26
Olson, Niels, 52
Ormond, Joshua, 89
Ott, Alan, 96, 100
Overfield, Cornell, 53
Oxford,Sean M, 142

P

Paciocco, Joni A., 25
Paladino, Katie D., 69
Palekar, Rakhee, 91
Palmiero, Andrew, 124
Panangala, Sidath V., 94, 102
Partners, Leavitt, 91
Patel, Dakshesh, 115
Patience, Marc A, 48, 50
Patterson,Thomas F., 27
Paul, J., 43
Pawlak, Mary, 55, 137
Pawlek, D. N., 140
Perez, Crystal A., 25
Perl, Libby, 94
Perron, Michel, 58
Perry, Jason, 58
Peters, Heidi M, 70, 71
Petersen, Johan, 31
Petersen, Lonnie, 31
Peterson, Marissa K, 119
Pfaff, C. A., 57
Pfaff, James A., 24

Phelps, B. R., 82
Pineda,Justino R., 28
Pinkos, Kevis, 32
Planet, Paul, 15
Polatty , David, 117
Porter, Ian M, 136
Powell-Dunford, Nicole, 26
Prakash, Abhinav, 123
Provenzano, D. A., 41
Pugnetti, Christie A., 89
Purcell, Stephanie, 89

Q

Qi, Chao, 31

R

Radoshitzky, Sheli R., 66
Raizes, Elliot G., 82
Ramaraju, Neelima, 91
Rambhia, Kunal J., 91
Ramey, Elizabeth, 119
Ramzy, Mark, 33
Rastogi, Vipin K., 67
Ray, Adrian S., 58
Reddy, Sravanthi, 115
Reid, Patrick, 13
Reponen, T., 18
Rheingold, Arnold L., 58
Rhode, Michael, 62
Rice, Charles L, 36
Richard, Stephanie A., 127, 128
Riegodedios, Asha J, 52
Rininsland, Frauke H., 101
Rivera, Danielle, 13, 38
Rivers, Bryan A, 54, 103
Roberge, Eric, 115
Robinson, Michael, 54
Roginski, Matthew A., 33
Rosenberg, Hans, 38
Rosenbloom, Daniel, 15
Rosenblum, Cherie, 53
Ross, Bruce, 58
Rothlauf, Paul W., 40
Rothwell, Stephen W, 36
Rouse, Alexandra, 89
Rowe, John, 133, 139
Ruane, Matthew J., 73
Rudy, Kippy, 91
Ruiz-Palacios,Guillermo M., 28
Rupp, Mark E, 69, 116
Ruth, Jerry L., 105

S

Sager, Michelle, 91
Sagripanti, Jose-Luis, 19
Sahly,Hana M., 28
Salazar, Heather M., 95
Saleh, Sharron, 107
Salisbury, Richard, 62
Sampey, Darryl B., 108
Sams, Valerie G., 28
Sanchez, Antonio O., 130, 131
Sandkovsky,Uriel, 28
Santarpia, George W., 13
Santarpia, Joshua, 13, 37
Sarata, Amanda K., 102, 141
Savell, Shelia C, 23
Schauer, Steven G., 24
Schaus, John, 100
Schiffer, Peter, 81
Schlaepfer,Eric, 31
Schmoldt, Michael, 123
Schnaubelt, Elizabeth R, 13, 116
Schnitzer, Jay, 91
Schoenitz, M., 18
Schoepp, Randal J., 108
Schofield, Christina, 127, 128
Schwedhelm, Michelle M, 116
Schwedhelm, Shelly, 69
Sears, Christine L, 52
Sekar, Kavya, 94, 95, 102, 144, 151
Seshadri, Srihari, 127, 128
Shackelford, S., 26
Shaffer, Ronald E., 124
Shaman, Jeffrey, 15
Shanthanna, H., 41
Shelhamer, Mehdi C., 29
Sherman, Gregory D., 84
Shittu, Atinuke, 15
Shurkin, Michael, 49
Siberry, George K., 82
Siddalingaiah, Simi V., 151
Siegel, Dustin, 58
Sieker,Jeremy, 31
Silcott, Blake, 37
Silcott, Braden, 37
Silcott, David, 37
Silcott, Peter, 37
Silcott, Ryan, 37
Sindle, Erin, 80
Skerrett, Catherine, 127, 128
Slone, Travis S., 77
Sne, N., 43
Sohn, Linda, 104
Solari, Ian L, 29

Soloveva, Veronica, 58
Sommer, D. D., 42
Sonnek, Naomi M., 40
Sosna, William, 59
Spooner, Christina, 127, 128
Staman, Jennifer A., 102
Stambaugh,Mark, 31
Stanek, Clay, 121
Stanley, Sharon A., 111
Starr, Clarise, 62
Steele, William A., 29
Stone, Farrah, 89
Strand, N. H., 41
Stray, Kirsten M., 58
Strickley, Robert, 58
Sullivan, James, 117
Summers-Stay, Douglas, 74
Suresh,Preetham, 31
Sussman, Jared S., 94, 102
Sutor, Peter, 74
Sutton, Edward L., 83
Swaminathan, Swami, 58
Sweeney,Daniel A., 28
Swift, Austin, 80

T

Talbot, Laura A, 36
Tallis, Joshua, 53
Tamin, Azaibi, 63
Tapia, Ashley D., 24
Tapson,Victor, 28
Temko-Blinder, Janet, 89
Tesh, Robert B., 108
Tetteh, Hassan A, 98
Tewfik, M. A., 42
Tham, Wei Y, 81
Thornburg, Natalie J., 63
Thursby, Jerry G, 81
Thursby, Marie C, 81
Tierney, Patrick, 89
Tomashek,Kay M., 28
Tran, Francis V., 55
Trice, Joshua, 14, 122
Trueblood, Wesley A., 24
Tse, Wayne, 35

U

Uber, Ian, 32
Ud-Dean, Minhaz, 15
Usmani, Adnan M., 40
Utz, Gregory, 127, 128

V

Vallejos,Theodore, 31
Van Doremalen, Neeltje, 63
Vasa, Angela, 69, 117
Vasan,Aditya, 31
Vasquez, Richard B., 27, 97
Veigl, Alena, 61
Venkatram,Vikram, 83
Vittinghoff, Eric, 29
Voelker, C., 131
Voelker, Chet R., 130
Von Thun, Annette M, 52
Voorhies, Phoenix, 102
Voss, Clare R, 60, 68, 74

W

Wadman, Michael, 69, 117
Wallace, Lalena, 67
Wallace, William H., 125
Walsh, Joseph T, 81
Wander, Joseph, 16, 22, 124, 125
Wang, Dashun, 81
Wang, Queenie, 58
Wang, Xin, 40
Warkentien, Tyler, 127
Warren, Travis K., 58
Watanabe, Mika, 104
Watson, Suzanne, 69
Weekes,Reiley, 31
Weimerskirch, Brian, 32
Weinberg, Samuel E, 31
Weitzel, E. K., 42
Welborn, Robert, 118
Werner, Thomas, 121
Wesson, Paul D., 29
Weyer, Jessica L., 66
Whelan, Sean P., 40
Wilhelm, Ben, 94
Wilkeron, Taylor, 91
Williams, Alan, 127
Williamson, Brandi N., 63
Winkler, Meredith, 119
Winnett, Alexander, 104
Witterick, I. J., 43
Wolfe, Lydia, 58
Wolfe,Cameron R., 28
Woo, Myung-Heiu, 125
Woo, Myung-Heui, 17
Woo, Myung-Huei, 19
Wood, Tess, 59
Worlton, Tamara, 32
Wren, David M., 136

Wright, Candice N., 149
Wu, Chang-Yu, 125
Wu, Chang-Yu, 17

X

Xia, Hui, 60, 132, 145
Xu, Yili, 58
Xydakis, Michael S., 43

Y

Yermakov, M., 18
Yin, Yian, 81
Yuan, T., 131
Yuan, Tony, 130
Yun, Heather, 55, 137

Z

Zang, Ruochen, 39
Zbylut, Michelle I., 56
Zeng, Qiru, 40
Zhang, Lijun, 58
Zhao, Lihui, 31
Zhuang, Ziqing, 124

Subject Index

A

accidents, 57
acids, 66, 102, 107, 109
acquisition, 70, 71, 73, 85, 93, 108, 151
active duty, 45, 57, 97, 127, 129, 137
aeromedical evacuation, 23, 36, 100
aerosol generators, 19
aerosols, 14, 16, 17, 18, 20, 22, 43, 54, 63, 104, 123, 124, 125, 126
aerospace medicine, 27, 129
Afghanistan conflict, 51
agent-based simulations, 45, 136
air filters, 17, 20
air flow, 13, 18
Air Force, 23, 29, 57, 61, 79, 85, 93, 97, 114, 128, 137, 140, 144
Air Force Facilities, 129, 144
air power, 57
air supplies, 38
air traffic, 55
airborne, 13, 14, 17, 18, 22, 124
aircraft carriers, 50, 52, 57
aircrafts, 38, 55, 57
airway management, 13, 23, 28, 31, 37, 43, 47
alanine, 32, 59
algorithms, 121
allocations, 72, 73
amputation, 35
amputees, 35
anatomical models, 106
animal diseases, 26
animals, 65, 118, 142
annealing, 122
anthrax, 143, 144
anti bacterial agents, 39
anti-bacterial agents, 29
antibiotics, 121
antibodies, 83, 103, 108, 139, 153
antigens, 102
anti-infective agents, 140
antimalarials, 38
antimicrobial agents, 17
antiviral agents, 23, 83, 106, 121, 140, 143
antiviral drugs, 64
application software, 92
arthropod born diseases, 105
artificial intelligence, 60, 68, 80, 96, 135
assaying, 21, 64
assays, 21, 106, 107, 109, 145, 153
atomization, 16
auxiliary power units, 38

B

bacillus subtilis, 18
background noise, 139
bacteria, 29, 67, 108, 109, 129
bacteriophages, 122
bactoriophages, 17
best practices, 13, 37, 87, 97, 146
big data, 135
bile, 40
bioassay, 21, 56, 104, 107
biocides, 125
biological aerosols, 17, 18, 19, 20, 21
biological agent detectors, 21
biological agents, 18, 109
biological contamination, 21
biological detection, 109, 153
biological markers, 47
biological products, 149
biological sciences, 60, 61, 68, 99
biological warfare, 36, 99, 109
biological weapons, 67
biomedical information systems, 65
biomedical research, 14, 26, 31, 32, 39, 61, 68, 99
biosafety, 54
biosensors, 56
bioterrorism, 22, 118, 142
bleaching agents, 21
blood transfusions, 59
bodily secretions, 59
botulism, 143, 144
business administration, 76, 77, 84, 85, 88, 89, 91, 92, 93, 113, 114, 135, 150

C

California, 91, 104
cancer, 35, 67
cardiovascular diseases, 35
cardiovascular physiological phenomena, 33, 37, 38
CARES Act, 86, 87, 88, 90, 93, 94, 113, 114, 150, 152
case studies, 34, 134
casualties, 119
catastrophic conditions, 110, 111
causalities, 111
cell physiological processes, 40, 64
cells, 26, 40, 47, 52, 59, 64, 66, 96, 102
central nervous system, 39
cerebrovascular disorders, 39
chain reactions, 105, 136
chemical agents, 105, 106, 109

chemical analysis, 59
chemical synthesis, 26
chemistry, 18, 26, 102
chikungunya virus, 105
chlorides, 59
civil affairs, 73
civilian personnel, 113
cleaning, 18, 133, 140, 141
clinical laboratory techniques (medicine), 32
clinical medicine, 109
clinical trials, 47, 48, 59, 129, 151
clones, 106
collective protection, 143
colon, 40
combat injuries, 51
combustion, 18
command and control, 97, 112
commerce, 77, 84, 87, 89, 113
commercial aircraft, 38
communication systems, 85, 92
composite materials, 18
computational linguistics, 60, 68
computational science, 60, 68, 121, 136
computer access control, 146
computer science, 135
computers, 85
congress, 87, 89, 91, 95, 96, 103, 113, 114, 118, 142, 144, 145, 147, 148, 149, 150, 152
construction, 101
contamination, 14, 17, 18, 21, 125
contractors, 88
contracts, 53, 72, 73, 85, 88, 93, 115, 144, 151
copyrights, 148
costs, 31, 65, 88, 143, 147
countermeasures, 136, 143, 144
crisis management, 110
culture techniques, 61
cybersecurity, 44, 85, 86, 135
cytokines, 47, 121

D

data analysis, 56, 77, 146, 148, 154
data management, 135
data mining, 136
data science, 122, 136
data sets, 135
databases, 132
death, 30, 37, 42, 64, 76, 87, 111, 130
decision making, 14
decontamination, 18, 19, 20, 21, 22, 68, 69, 125, 126
defense industry, 72, 73, 78
delivery of health care, 87, 103, 104
demographic cohorts, 131
demography, 132
dengue, 105
Department of State, 91
Department of Veterans Affairs, 91, 95
detection, 38, 57, 62, 75, 96, 102, 105, 107, 109, 125, 126, 127, 129, 130, 131, 139, 145, 153, 154
detectors, 21, 38
deterrence, 57, 74
diabetes mellitus, 35
diarrhea, 138
diptera, 105
disasters, 97, 100, 110, 119
disease outbreaks, 23, 26, 29, 36, 37, 38, 41, 45, 46, 47, 50, 51, 52, 59, 60, 61, 63, 68, 69, 77, 79, 83, 84, 87, 91, 92, 95, 98, 102, 112, 118, 123, 126, 127, 130, 134, 137, 140, 142, 143, 144, 145, 147, 149, 150
diseases and disorders, 29, 45, 46, 60, 63, 67, 68, 83, 94, 97, 118, 128, 131, 137, 138, 140, 142, 145, 147
disinfection, 17, 18, 19, 67, 68, 133, 139
display systems, 139
distance learning, 54, 80
District of Columbia, 147
drops, 20
drug abuse, 42
drug therapy, 39, 42, 47, 83
drugs, 121
drying, 107
dyes, 20

E

Ebola, 52, 53, 59, 66, 67, 99, 141
ebola virus, 66, 98
economic development, 76, 83
economic impact, 72
economic security, 85, 88, 147
economics, 78
efficiency, 123
electronic mail, 85, 93, 115
emergencies, 36, 47, 71, 72, 73, 95, 97, 100, 110, 117, 119, 143, 144, 145, 147
emergency medicine, 33, 34, 47
emergency response, 94, 95, 96, 103, 115, 119
employment, 89, 92, 103, 114, 150
encephalitis, 39, 61, 105
endoscopes, 43
energetic properties, 18, 125
energy, 72, 76, 125, 126
engineering, 56, 99, 109, 115, 138, 146
environment, 13, 61, 63, 96, 132
environmental health, 15
environmental pollutants, 13
environmental protection, 91, 115, 118, 142
enzymes, 109

epidemiology, 34, 121
epithelial cells, 40
essential amino acids, 59
estimators, 126
ethnic groups, 52, 114
evacuation, 23, 45
exposure, 133, 139

F

fabrics, 123
feces, 40
federal budgets, 80, 100
fibers, 123
filters, 13, 17, 18, 20, 110, 121, 125
filtration, 13, 18, 20, 69, 70, 123, 126
finance, 93, 115
financial management, 85, 113
finite element analysis, 56
flight testing, 38
flow rate, 16, 146
fluid dynamics, 132
force protection, 67
foreign policy, 83
foreign relations, 79, 83
fungi, 29

G

gel electrophoresis, 153
gene expression, 153
general surgery, 32, 43
genetic markers, 56
genetics, 26
genome, 61, 99, 109, 145
genomes, 61
geographic regions, 76, 92, 129
geography, 79, 91, 114, 136, 146, 148, 150
germicides, 125
global positioning systems, 80
globalization, 77
glycoproteins, 64, 66
glycoprotiens, 108
government procurement, 70, 71, 92, 150, 152
governments, 70, 72, 76, 78, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 91, 93, 94, 96, 97, 99, 100, 101, 103, 115, 118, 121, 129, 134, 137, 138, 141, 142, 144, 146, 147, 148, 150, 152, 153
graphical user interface, 138

H

half life, 61
health care, 86
health care facilities, 110, 119
health care management, 110
health services, 13, 14, 23, 26, 28, 35, 36, 37, 42, 44, 50, 51, 53, 56, 59, 60, 61, 67, 68, 76, 77, 78, 79, 80, 82, 83, 84, 85, 86, 87, 91, 92, 95, 98, 99, 101, 103, 112, 113, 114, 117, 119, 120, 122, 126, 129, 130, 132, 134, 135, 136, 140, 143, 144, 145, 147, 148, 149,150, 152
heat, 13, 19, 21, 70, 125, 126
heat recovery, 13
hemorrhagic fevers, 58, 66, 105, 106
hepatitis, 26
high temperature, 61, 62
homeland defense, 97
homeland security, 55, 72, 80, 86, 87, 88, 91, 96, 97, 114, 118, 142, 150
hospitalizations, 29, 31, 45, 52
hospitals, 42, 45, 51, 52, 98, 100, 110, 131
House of Representatives, 89, 113, 149, 152, 153
human factors engineering, 56
human performance test, 104
human rights, 80
human systems integration, 56
humanitarian assistance, 33, 101, 115, 120
humidity, 17, 61
hygiene, 23, 29, 37, 45, 46, 50, 51, 53, 59, 67, 69, 84, 87, 91, 92, 95, 103, 112, 114, 120, 122, 123, 126, 130, 134, 136, 145, 147, 150
hypertension, 35
hypochlorites, 21
hypotension, 47
hypoxia, 47

I

Ibrahim,, 16
immune system, 42, 47, 83, 149
immunoassay, 108
immunology, 108
in vitro analysis, 64
inclusions, 138
industrial modernization, 72
industrial relations, 73
industries, 72, 74
infection, 14, 15, 28, 29, 35, 37, 38, 39, 40, 41, 42, 44, 45, 51, 55, 59, 65, 66, 67, 83, 98, 104, 107, 117, 123, 126, 127, 133, 139
infectious disease transmission, 14, 55, 133, 140
infectious diseases, 20, 29, 34, 35, 37, 38, 45, 80, 97, 99, 114, 118, 142, 152, 153
influenza, 15, 16, 19, 21, 22, 26, 29, 31, 32, 65, 66, 100, 110, 111, 126, 128, 129, 131, 144, 153
influenza virus, 15, 16, 22, 121, 126
information exchange, 96
information science, 121, 128, 136

information security, 44, 135
information systems, 49, 80, 85, 88, 113, 135
inhibitors, 26, 38, 52, 107
institutional review board, 144
instruction manuals, 54
intellectual property, 76, 150, 152, 153
intensive care units, 33, 43
interagency coordination, 92, 111, 120, 150
interferon, 26, 64, 66, 102
intergovernmental organizations, 78
internal medicine, 29, 138
international organizations, 76, 77, 78, 79, 80, 134
international relations, 76, 77, 78, 83, 134
international trade, 72, 76
internet of things, 78
intervention, 30, 123, 126, 138, 140
intestines, 59
intubation, 32, 37, 43, 47
investments, 72, 76, 78, 99
iodine, 17, 18
irradiation, 17, 20, 21, 69, 125, 126

L

lassa fever virus, 108
law, 70, 76, 78, 79, 86, 89, 90, 95, 96, 97, 101, 103, 110, 143, 147, 148
leadership, 51, 80, 98, 100
legislation, 72, 143
legs, 35
lepidoptera, 77
lethality, 106
light sources, 69, 138
lightweight, 153
liquid chromatography, 59
liquid crystal displays, 138
logistics, 23, 93, 103, 110, 111, 112, 113, 115, 122
low temperature, 61
lower limb amputations, 35
lung diseases, 31, 33, 37, 42
lymphocytes, 149

M

macaque monkeys, 106
machine learning, 74, 80, 135
management personnel, 92, 114, 150
market research, 86
materials, 16, 18, 62, 72, 73, 74, 122, 144, 151
mathematical models, 136
medical countermeasures, 87, 143, 145, 149, 151
medical equipment, 31, 71, 83
medical evacuation, 45
medical personnel, 14, 23, 26, 32, 36, 37, 38, 42, 44, 45, 50, 51, 53, 69, 76, 77, 79, 80, 84, 85, 86, 92, 95, 97, 99, 100, 102, 103, 112, 113, 114, 119, 120, 129, 130, 134, 136, 137, 140, 144, 146, 149, 150, 152
medical screening, 44, 104
medical specialties, 138
medical technicians, 44, 45
medicare, 147
medicine, 121
membranes, 29, 65
mental, 46, 53
mental health, 46
mers cov, 137
mers-cov, 59, 95, 102
microbiology, 60, 68, 130
microorganisms, 17, 63
Middle East, 47, 138, 139, 154
military acquisition, 70, 71
military capabilities, 101
military hospitals, 34, 44, 51
military medicine, 23, 34, 35, 36, 44, 50, 51, 52, 61, 86, 92, 93, 98, 101, 103, 112, 114, 127, 128, 137, 146
military operations, 57, 98, 143
military personnel, 34, 51, 56, 57, 61, 98, 105, 122
military research, 56, 130
military science, 78, 85, 92
military strategy, 101
military supplies, 74
military training, 49, 55, 57, 138, 140
minority groups, 145, 152
missions, 101
mobile application software, 54
mobile phones, 54, 80, 85
mobilization, 71, 72, 73, 74
mononuclear phagocyte system, 47
monte carlo method, 132
motor skills, 54

N

national defense, 72
National Guard, 34, 36, 96, 97, 100, 101
national politics, 78, 79, 83, 91
national security, 50, 51, 57, 70, 71, 72, 74, 76, 78, 79, 80, 84, 85, 86, 88, 89, 99, 100, 110, 118, 134, 142, 150
Native Americans, 103
natural language processing, 60, 68
naval operations, 50, 112
Navy, 33, 46, 50, 52, 57, 84, 93, 112, 113, 137, 146
nervous system, 39, 42
network science, 135, 136
neural networks, 60, 68, 80, 121
neurological manifestations, 39
neuromuscular agents, 33

New Mexico, 102
New York, 15, 30, 33, 129, 132, 146, 148
North Korea, 57
nuclear magnetic resonance, 59
nucleoprotiens, 108

O

office buildings, 133, 139
olfactory nerve, 44
operating systems, 139
Operation Warp Speed, 151, 152, 153
opioids, 42
optimization, 122
otorhinolaryngology, 44
oxygen, 30, 39, 47, 110
oxygenation, 29, 30, 33

P

pain, 15, 23, 42, 53, 137
paramedics, 119
parasitic diseases, 45
particle size, 13, 16, 22, 123
particles, 17, 18, 20, 22, 124
particulates, 123
passengers, 55
patents, 139
pathogenesis, 40, 106
pathogenic microorganisms, 18, 106
patient care, 14, 23, 28, 32, 33, 35, 37, 42, 43, 44, 45, 47, 51, 82, 103, 119
patients, 14, 23, 24, 25, 27, 28, 29, 31, 32, 33, 39, 40, 42, 43, 45, 46, 48, 105, 110, 116, 119, 141, 147
peacetime, 57
peptide hydrolysis, 106
Personal Protective Equipment, 101
personal protective equipment (PPE), 14, 32, 54, 88, 93, 121, 122, 123, 143
personnel management, 77, 85, 91, 92, 113, 114, 135, 150
pharmacies, 148
pharmacology, 42
photolithography, 56
physicians, 27, 34, 42, 45, 51, 119
physics, 130, 132
physics laboratories, 130, 132
planning, 75, 92, 111, 120, 151
plasmids, 105
plasmonic, 56, 57
policies, 27, 42, 53, 72, 73, 76, 81, 84, 86, 92, 97, 103, 133, 140, 148
political movements, 78
polymerization, 21
porosity, 123
portable equipment, 153
predictive modeling, 87, 126, 129
preventive medicine, 129
privacy, 44, 135
probes, 106, 107
procurement, 85, 86, 87, 88, 93, 115, 151
production, 24, 70, 71, 72, 76, 88, 149
prosthetics, 35
protective, 122
protective equipment, 14, 21, 32, 43, 54, 93, 110, 121, 122, 123, 143
protective mask, 22
protective mask facepieces, 125
protective masks, 123
proteins, 17, 52, 66, 102, 106, 108, 149
proteomics, 26
prototypes, 109
psychiatry, 46
public health, 14, 15, 22, 34, 36, 41, 45, 46, 50, 51, 53, 54, 55, 61, 70, 77, 78, 80, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 93, 94, 95, 97, 98, 100, 103, 104, 111, 114, 117, 118, 120, 121, 122, 126, 129, 130, 132, 133, 134, 135, 138, 139, 140, 142, 143, 144, 145, 147, 149, 152, 153
public policy, 80, 91, 114
public safety, 55, 110
pulmonology, 102
purification, 108, 109

Q

quantum dots, 56
quarantine, 14, 27, 34, 45, 49, 50, 51, 53, 80, 84, 88, 91, 92, 95, 98, 114, 117, 122, 126, 129, 130, 132, 133, 134, 136, 137, 139, 140, 143

R

rapid deployment, 67
rats, 64
reagents, 62, 105, 106, 107, 108, 109, 131, 153, 154
recovery, 28, 34, 55, 76, 81, 150
reliability, 132
research facilities, 129
resources, 34, 44, 71, 72, 78, 83, 85, 92, 94, 117, 136, 146, 148
respiration, 39, 47
respiration disorders, 14
respirator, 21, 22, 124
respirators, 20, 21, 22, 37, 68, 69, 122, 124, 126
respiratory physiological phenomena, 31, 33, 47
respiratory physiological processes, 37, 47
respiratory signs and symptoms, 37
respiratory system, 17, 20, 64

respiratory tract diseases, 14, 15, 38, 41, 59, 61, 63, 68, 95, 117, 123, 149
ribonucleic acid, 105
ribonucleic acids, 14, 59, 64
rift valley fever, 105
risk, 13, 31, 32, 34, 35, 37, 38, 39, 41, 42, 43, 45, 49, 55, 79, 86, 95, 96, 99, 100, 116, 118, 133, 135, 138, 140, 142
risk analysis, 31, 35, 38, 100, 131
risk factors, 35, 138
RNA viruses, 40
RNA Viruses, 69

S

sampling, 15, 21, 22, 117, 126
scientific literature, 69
scientists, 54, 65, 77, 82, 104, 145
seafarers, 53
secretion, 20
security, 72, 78, 79, 80, 87, 88, 96, 97, 99, 111, 118, 135, 142
sense organs, 66
ships, 32, 33, 45, 46, 50, 53, 137
signs and symptoms, 37, 64, 133, 138, 140
simulations, 45, 56, 129, 132
situational awareness, 143
small business, 78, 87, 88, 89, 91
small intestine, 40, 59
smell, 44
spores, 18
stainless steel, 61, 63, 137
statistical analysis, 41, 61, 138
statistics, 82, 122
steam, 125
stockpiles, 74, 121
strategic materials, 73
strategic warning, 74
strategy, 34, 49, 70, 81, 100, 105, 110, 125, 126, 145
students, 81, 92
sunlight, 19
supply chain, 70, 86, 87, 92, 112, 122
supply chain integrity, 150
supply chain management, 93, 112, 115
supreme court, 70
surfaces, 62, 63, 68, 137
surges, 111
surgical amputations, 35
surveillance, 15, 61, 65, 126, 129, 134, 141, 144, 145
surveys, 54, 134, 146
survival equipment, 137
sustainment, 93, 112
synthesis, 26, 105
systems engineering, 38

T

taste, 44
terrorism, 143
test equipment, 124
test methods, 109, 129, 132
textiles, 123
therapeutics, 48, 59, 87, 106, 151, 152, 153
therapy, 28, 29, 34, 35, 37, 38, 39, 42, 45, 46, 47, 48, 51, 59, 86, 87, 92, 95, 102, 103, 104, 106, 114, 117, 121, 152, 153
threats, 17, 52, 90, 93, 99, 114, 118, 121, 142, 153
tickborne diseases, 105
toxicity, 126
tracheotomy, 43
trainees, 140
training, 23, 49, 55, 56, 74, 99, 104, 112, 115, 119, 136, 138, 140, 141, 146
transport aircraft, 38
treaties, 78
trypsin, 66

U

ultraviolet lamps, 18
ultraviolet radiation, 19, 21, 125
Unified Combatant Commands, 101
United States Africa Command, 98
United States Northern Command, 114
United States Transportation Command, 38, 113
universities, 146, 148
USS Arleigh Burke, 112
USS Theodore Roosevelt, 50, 53, 57, 84, 112
USSR, 74

V

vaccina virus, 107
vaccination, 126, 146, 147, 148, 151
vaccines, 26, 52, 61, 87, 103, 106, 127, 129, 130, 144, 147, 149, 151, 152, 153
variola virus, 107, 143
ventilation, 13, 25, 33, 37, 43, 47, 110
ventilators, 31, 43, 83, 110
veterans health, 35, 104, 148
viability, 16, 111
video teleconferencing, 85
viral hemorrhagic fevers, 58
viral pneumonia, 137
virus diseases, 23, 26, 29, 31, 34, 37, 46, 59, 68, 69
viruses, 22, 40, 52, 65, 66, 67, 121
visualizations, 148
volatile organic compounds, 13
vulnerability, 122

W

warfare, 73, 79, 85, 112, 114
wearable technology, 139
West Africa, 59, 98
wound infections, 55, 126

Z

zoonoses, 26, 59, 102
zoonotic diseases, 41