CNA Research Highlights
FY 2015

Emerging Lines of Research

Developing State-of-the-Art Electronic Warfare Systems

CNA is working with the Navy to develop new electronic warfare (EW) capabilities to guard against threats to U.S. missiles and command, control, and communications (C3) systems.

Strengthening the Cybersecurity Measures

CNA has field representatives assigned to Commander, Operational Test and Evaluation Force (COMOPTEVFOR) to assess, among other things, new approaches to be used for Navy cybersecurity testing. Additionally CNA's Cyber Policy Wargame was used by representatives from DOD's policy, cyber, operational, and intelligence communities to facilitate cross-functional discussions and inform the development of policy and procedures among the three communities.

Enabling Navy Cloud Initiatives Afloat: An Early Look

Over the past few years the Department of the Navy has been taking steps to store its unclassified data and processes on a commercial cloud. A particular interest was the application of Big Data technologies. We conducted various analyses and offered recommendations to the Navy on new statistics/software engineering disciplines needed to exploit Big Data.

Keeping IT Systems Reliable and Secure

Warfighters rely on many information technology (IT) systems—to gather and process data, communicate, visualize the battlespace, project possible courses of action, and implement decisions. We identified critical shortfalls in systems and procedures to improve interoperability and cybersecurity.

Contingency Operations, Reconstruction, and Exercise Analysis

Direct Support to Humanitarian Operations

Our CNA field representative to III Marine Expeditionary Force (MEF) deployed with Joint Task Force 505 (Forward) to Kathmandu in support of the related humanitarian operation. When deployed, the CNA analyst developed assessment metrics for the operation and, after returning to III MEF, supported a lessons-learned seminar for senior leadership: comparing Operation Sahayogi Haat with relief efforts after Typhoon Yolanda in the Philippines in 2013.

L'Enfant Plaza Metro Station Incident After-Action Report (AAR)

In January 2015, District of Columbia rescue personnel responded to reports of smoke at L'Enfant Plaza Metro Station and found a disabled six-car Yellow Line Metro train and its passengers in distress from heavy smoke caused by an electrical malfunction. CNA supported the District of Columbia Homeland Security and Emergency Management Agency (HSEMA) in conducting an after-action review of the District's response to the incident.

CNA's Work in Operation Enduring Freedom (OEF) Afghanistan

Our field representative to the First Marine Expeditionary Forces (Forward) in Afghanistan conducted an analysis of indirect fire incidents; a regression analysis of significant events; an analysis of Afghanistan National Security Forces (ANSF) casualties; and an analysis of work-stream interrelationships and staff coordination.

Reconstruction and Analysis of Syrian WMD Destruction Planning and Execution

In September 2013, following allegations of illegal chemical weapons use by Syria, the Defense Threat Reduction Agency (DTRA) asked CNA to conduct a reconstruction and analysis of certain aspects of the oversight of the Syrian chemical weapons destruction operation.

Supporting Bold Alligator 2014

Bold Alligator (BA), an amphibious assault exercise, was designed to test and rejuvenate Navy–Marine Corps amphibious skills. A team of six CNA field reps and headquarters analysts supported the Navy Warfare Development Command to conduct a reconstruction of the exercise events and glean lessons learned to inform future policy and procedures in amphibious warfare.

Help the Nation Prepare for Climate Change

CNA is holding a series of exercises around the country to help localities better understand the challenges they might face due to climate change (e.g., sea-level rise, higher temperatures, precipitation changes) and extreme weather events (e.g., wildfires, heat waves, cold waves, hurricanes, drought). To date, we have completed climate change adaptation planning workshops for federal agencies and regional workshops for Houston, Texas; Fort Collins, Colorado; and Anchorage, Alaska.

Exercise Support to the U.S. Department of Health and Human Services (HHS)

CNA supported HHS in planning, conducting, and evaluating six exercises that examined several of its roles and responsibilities including coordinating with international partners during international emergencies (such as pandemics); Stafford Act implementation; and mass patient movement under the National Disaster Medical System. Our after-action reports highlighted capability gaps and recommended ways to improve plans, processes, and procedures.

Study of Ambush Attacks on Law Enforcement Officers

CNA recently conducted a comprehensive study for DOJ's Office of Community Oriented Policing Services on civilian ambush attacks on police— the first substantive research focused on civilian ambush attacks on police in over three decades.

Exploring New Uses for the Joint High-Speed Vessel (JHSV)

As the Navy decommissions its frigates it is looking at ways to conduct the missions that historically have been assigned to these platforms. One such mission is countering illicit trafficking in the Southern Command area of operations. FOURTH Fleet wanted to know how well this mission could be done by a joint high-speed vessel (JHSV). CNA recently completed the data collection and analysis aboard USNS *Spearhead* (JHSV-1) to determine how well the ship could detect and monitor illicit trafficking in the Southern Command area and, potentially serve as an afloat forward-staging base to support counter illicit trafficking operations.

Plans and Concept Development Analysis

National Capital Region (NCR) Energy Workshop Series

What would happen if the National Capital Region (NCR) had a long-term power outage? CNA hosted a NCR Energy Workshop Series, which focused on the consequences of a long-term outage of the electrical grid in the NCR. The workshops identified several deficiencies in current NCR energy plans.

USMC F-35Bs Mix

We explored a wide variety of possible F-35 aircraft mixes and assessed how each might perform. We also highlighted institutional decisions that the Marine Corps will have to make for the F-35B to be a game-changer.

Alternative Military Base Management Concepts: A Survey of Potential Opportunities

The Navy's Shore Readiness Division (OPNAV N46) asked CNA to study alternative concepts for military base management that could be beneficial to the operation of Navy installations. These include community partnerships for sharing resources; privatization of an installation's utilities services; and enhanced use leasing, in which a private developer can improve and then lease an underused site on federal land. We used a case-study approach with information provided by the U.S. Navy, Marine Corps, Army, and Air Force, and the U.K. Ministry of Defense.

Advanced Technology Threat Assessments and Tactics Development

Countering Our Adversaries' A2/AD Threat

U.S. adversaries are developing an increasingly complex set of anti-access and area-denial (A2/AD) strategies and capabilities, designed to keep U.S. forces out of certain areas or obstruct their operations there. CNA is helping DOD leadership develop technical, tactical, and

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operational solutions to this growing A2/AD threat. Using both war gaming and analyses we are helping the Office of Net Assessment, the Commandant of the Marine Corps and his senior staff, and the Deputy Chief of Naval Operations Warfare Systems (OPNAV N9).

A New Surface Ship Air Defense

The Naval Integrated Fire Control-Counter Air (NIFC-CA) sensor system extends the ship's view, giving it a much better chance of survival. CNA is helping the Navy set priorities for improvements in surface ship air defense. We examined near- and mid-term options to provide this sensor system.

Response to Cybersecurity Threats in the Pacific Command

Our CNA field representative to U.S. Pacific Command is assisting that command's J6 (Command, Control, Communications, and Cyber) Directorate in strengthening its playbook to respond to cybersecurity threats and to streamline other pre-planned actions.

Should UAV Systems be Even More Autonomous?

Last year, we conducted a study on the value of making maritime UAVs more autonomous by means of algorithms embedded in the UAV's onboard computers. We are now evaluating the results and documenting the current and projected technology levels required to support various aspects of UAV autonomous strike operations.

Improving the Navy's Response to a New Missile Threat

Commander, Naval Forces Europe (NAVEUR) asked CNA to analyze its intelligence, surveillance, and reconnaissance (ISR) options for responding to new missile threats in NAVEUR. We offered recommendations on how the command could modify its data collection and assessment methods as well as how it could coordinate more closely with partners and allies to complement its ISR operations.

Fighting Off Swarms of Small Boats Near Shore

How can carrier strike groups fight off swarms of small, fast, well-armed boats that harass or attack them in the cluttered waters of a littoral? The Naval Strike and Air Warfare Center asked us to develop a model that simulates the swarm threat and evaluates the naval force response.

Policy and Regional Security Analysis

How Will Further Fracking Affect the Delaware River Basin?

The Delaware River Basin (DRB) Commission has put a moratorium on fracking in the river basin, and is considering whether to lift it. In a project sponsored by the Delaware Riverkeeper Network, a CNA team modeled the landscape of the Marcellus Shale region to predict how it might change in response to the expansion of natural gas extraction, and, in particular, what impact this might have on the DRB.

EPA's Clean Power Plan and Its Impact on Texas

In November 2014, CNA released *The Impacts of EPA's Clean Power Plan on Electricity Generation and Water Use in Texas* to assess water use for thermoelectric cooling. The report showed that water consumption in Texas's power sector could decrease from 20 to 35 percent, depending on how the Clean Power Plan was implemented.

Russia's Use of Ambiguous Warfare: Implications for the Marine Corps

Russia's new doctrine of ambiguous warfare depends on the ability to rapidly generate highly trained and disciplined forces that enter the battle space (e.g., in Crimea) out of uniform and, in coordination with local supporters, utilize psychological operations, intimidation, and bribery to undermine resistance. CNA held an event to explore the issues associated with the nature of these "new" operations and how they might be counteracted.

Establishing the Office of an Executive Agent for the Arctic

The Navy's Strategy and Policy Division (N51) asked CNA to determine the requirements for establishing an office within the Navy to be the DOD's Arctic Executive Agent. We proposed an organizational structure and estimated the manpower and annual costs for the Navy to undertake the mission.

What Led to the U.S.-China Confidence-Building Measures?

On November 12, 2014, the United States and China announced that they had agreed to implement a two-part military-to-military confidence-building measure (CBM) on the notification of major military activities and observation of military exercises and activities.

CNA China Studies analyzed the process that led to the conclusion of an agreement and the positions, dynamics, and actions of the DOD and PLA that ultimately enabled them to reach a consensus. The final report provides lessons learned and recommendations to the sponsor that can help DOD more effectively engage PLA interlocutors in the future.

How Does China's Media Cover U.S. Pacific Operations?

CNA analysts are in their fourth year of providing U.S. Pacific Command with analyses of China's media coverage of PACOM operations and activities.

PLA Views on Escalation

CNA China Studies conducted two projects that examine PLA writings on the escalation of crisis and conflict: one provides a broad overview of critical elements of PLA views on the topic, and the other looks more closely at operational implications.

Analysis of Boko Haram

CNA recently completed a "deep dive" on the Boko Haram insurgency in Nigeria. In the course of the study, a conflict assessment, a compendium of the U.S. government's actions to counter Boko Haram, and a compendium of the Nigerian government's actions to counter Boko Haram were completed.

How Will Climate Change Affect U.S. Military Operations and Security Cooperation in the Asia Pacific?

In fall 2014, the Office of the Secretary of Defense asked CNA to survey the anticipated impacts of climate change on the countries of the Asia Pacific, and to assess their implications for DOD posture, operations, and relationships over the next 30 years given that the region will likely experience storms, flooding, drought, and agricultural stresses with greater frequency and intensity. The report recommends several ways that DOD can better leverage its capabilities and engage regional partners to mitigate risks and improve regional resilience and cooperation.

Program Testing, Evaluation, and Assessment

A Study of Air Traffic Patterns for the FAA

The Federal Aviation Administration created the Data Informed Prioritization Task Force, which determines how best to allocate the FAA's global air traffic assets and prioritize the FAA's obligations to, and agreements with, the international aviation community. CNA supported the task force by providing a detailed study of air traffic patterns over the past three years between the United States and its neighboring foreign airspaces.

Developing Force Management Software & Force Generation Tools

In 2003, CNA developed a software suite called Slider, which allows the user to easily explore ship scheduling alternatives. With Slider, the user can graphically display a schedule and then manipulate it without losing the underlying data or the ability to compute and display selected statistics. Slider was developed as the standard software suite for real-world force scheduling and force generation projections for the U.S. Navy, the CNO, and the Joint Staff. CNA recently expanded Slider to allow the Navy to manage the disposition of critical munitions.

Testing the New Joint Strike Fighter

After years of concerns, the "B" variant of the F-35 Joint Strike Fighter—the Marine Corps' short-takeoff-and-vertical-landing (STOVL) variant—was declared operational last July. In May 2014, it underwent the first phase of its operational testing when six F-35Bs deployed on USS *Wasp.* CNA's field representative to the Joint Operational Test Team (JOTT), evaluated both the F-35Bs and *Wasp*'s ability to support them.

Pandarra Net: Testing High-Bandwidth Communications Systems

In late March, several CNA analysts traveled to Sasebo, Japan, to support the first phased test of Pandarra Net—an experiment by Commander, Seventh Fleet, to test commercial systems that bring high-bandwidth communications to ships. CNA analysts wrote the test plan and data collection plan for Pandarra Net. The CNA headquarters team is analyzing the data, which will be used by the Navy to better understand the capabilities and benefits of this enhanced communications capability.

Testing the Next Generation of Identification Friend or Foe (IFF)

Over the years, a number of concerns have arisen regarding IFF Mode 4's IFF performance. The Department of Defense is now fielding its next generation of IFF—the Mark XIIA IFF Mode 5—which is meant to address the shortcomings

of the Mode 4. CNA is supporting a field exercise to assess combat system integration of Mode 5. We also recommended that the Navy pursue a system-of-systems engineering approach to design fixes and to improve future combat system integration.

How Do Mishaps Affect Fleet Readiness?
Mishaps on aircraft, ships, and submarines are very costly. CNA recently completed an analysis that identified changes in reporting streams that will provide NAVSAFECEN with data to support targeted Safety Campaign Plans and quantify the readiness impacts of mishaps.

Analyzing the Marine Corps' Motor Transport Structure
As budget cuts have forced cuts in motor transport (Motor T) assets (i.e. trucks, trailers, tanks, and personnel) the Marine Corps wanted to know if there were enough Motor T assets to support operations, and whether those assets were allocated and organized in the most appropriate way. To address these questions, we created a model of logistics resupply operations under sustained combat conditions. We also found that certain other changes would improve resupply effectiveness.

How Should the Navy Prioritize Investments in Its Shore Utilities?
Navy installations hold more than $24 billion of utilities infrastructure (i.e. cables and pipes, and some generation facilities such as steam plants). Utility outages are disruptive yet the money for investments in utility reliability (such as replacing an aging water pump) is limited. The Navy asked CNA to look at the current system of prioritizing utility reliability investments and make other recommendations.

Giving Pilots Better Access to Vital Notices
Pilots depend on Notices to Airmen (NOTAMs) to provide the information needed to make good decisions about flight safety and route choices. CNA continues to support the FAA's NOTAM Improvements Program. We have worked with key stakeholders in industry to understand what is needed in order to realize the improvements called for by the program.

A New Way for the FAA to Forecast Growth in Air Traffic
CNA fundamentally changed the way the FAA forecasts air traffic growth. Formerly, the agency used econometric models to translate regional economic growth into projected increases in air passengers, but they did not provide useful information on changes in air route structures that the passenger growth implied. CNA opined that data concerning the airlines themselves (airlines' earnings calls, aircraft orders, and announced market plans) resulted in a more effective approximation of future air traffic.

Collaborative Reform: Spokane, Philadelphia, and Fayetteville Police Departments
Violent clashes between police officers and the communities they serve are driving police departments around the country to question their use-of-force policies and look at ways to build trust with local citizens. Under grants from the U.S. Department of Justice's Office of Community Oriented Policing Services (COPS), CNA is conducting projects with the Spokane, Philadelphia, and Fayetteville Police Departments to assess and reform their use-of-force policies, practices, and related processes—taking into account national standards and community expectations. Over the past year, our assessment teams have conducted multiple site visits to each police department and we have recommended ways to improve use-of-force training; use-of-force investigations; and procedures for collecting, tracking, and analyzing case data. We are also monitoring the Spokane and Philadelphia Police Departments' implementation of the reforms.

Ensuring the Safety and Well-Being of Long-Term Care Residents and Beneficiaries
Residents and beneficiaries of long-term care (LTC) services can be the victims of abuse, neglect, and exploitation by their caregivers. To protect residents and beneficiaries from such mistreatment, the Affordable Care Act (ACA) established the National Background Check Program (NBCP) that provides grants to states for designing, implementing, and operating background check programs that meet the criteria listed in the ACA. So far, 25 states have received grants. CNA is providing technical assistance to these states to help them meet the ACA requirements, as well as develop national assessment criteria.

Adherence to Clinical Practice Guidelines for Hysterectomies
Navy Medicine asked CNA to update a 2010 CNA study on the variation in practice patterns and rates of hysterectomies performed at Navy military treatment facilities (MFTs). Based on our

analysis of FY 2013 Navy data, we estimated that if 90 percent of all abdominal hysterectomies were performed through the vaginal route, there would be nine fewer complications due to surgery, 411 fewer hospital days, and $1.2 million in cost savings across Navy catchment areas.

Manpower Policy and Workforce Management Analysis

Studying Female Marines' Performance in Aviation and Logistics Occupations

The Marine Corps Force Innovation Office is researching the potential implications of integrating women into ground combat occupations and units. CNA supports this work. Most recently, we completed a study that focused on female representation and perform-ance in two primary military occupational specialties (PMOSs), aviation and logistics, since FY 1987. The results will inform future USMC assignment and promotion policies.

What Are the Real Costs of Lower Recruit Quality?

If budget cuts force the Army to spend less on recruiting and advertising, how will it affect the quality (based on education and aptitude scores) and performance of future accession cohorts? We calculated the combination of recruiters, advertising expenses, enlistment bonuses, and education benefits required to achieve a target percentage of high-quality recruits, for a given unemployment rate. We generally found that Army cohorts that start with a higher percentage of high-quality recruits tend to remain higher quality, even as the cohort shrinks over time due to separations. We presented this work at the Army's Recruiting 2025 Conference in June, and a version of it will be published in an e-book that will be made available to the public.

Analysis of the Economy's Effects on Officer Retention

The Assistant Secretary of the Navy (Manpower and Reserve Affairs) asked us to explore the issue of retention of naval officers. We found—for pilots and surface warfare officers but not for Naval Flight Officers—certain measures from the civilian economy have a large estimated relationship with officer retention. We anticipate the Navy will use these findings in efforts to maintain manning in higher officer paygrades

through shaping, planning, and retention policies.

Shaping the Future Navy Civilian Workforce

In 2013, DOD civil servants experienced a pay freeze, a hiring freeze, furloughs, and a government shutdown. The Navy Resources and Assessment Division (N814) asked us to provide insight on whether the effects of the 2013 sequestration dramatically influenced Navy civilian retention; and on the likely shape and structure of the Navy's future civilian workforce by functional community and mission-critical designation. We examined the historical retention behavior of the USN civilian workforce and modeled how retention is influenced by demographics, job characteristics, and economic factors. Our model allows us to predict the Navy civilian workforce out to 2019 under different strategic force shaping strategies.

What's the Value of Including Clinical Pharmacists in a Patient Care Team?

In 2010, the Navy's Bureau of Medicine and Surgery (BUMED) mandated that all Navy Military Treatment Facilities implement a patient-centered medical care model—Medical Home Port (MHP)—where physician-led teams of health care providers coordinate patient care. BUMED asked us to investigate how MHPs use embedded clinical pharmacists. At some sites, we saw indications that these pharmacists led to significant improvements in medication adherence and better patient outcomes.

Obesity and the Army Reserve

Last year, the Army Marketing and Research Group asked us to study the effect of obesity rates on the Army's efforts to recruit non-prior-service (NPS) reservists. We also examined whether they tend to remain over weight standards during their first few years of service.

Training and Education Analysis

Finding the Right Mix of Synthetic and Live Training

When carrier strike groups (CSGs) train for a deployment they use both live and synthetic (i.e., computer-assisted) training events, and while live training—at-sea and in-flight—has traditionally predominated,synthetic training is taking an increasingly important role. We found that some mission tasks can be effectively trained via simulation, while others cannot, because of limitations in the simulation environment. Our results will be used by the

sponsor to optimize the content and structure of the training environment.

Analysis of the Boren Grants Program

The Defense Language and National Security Education Office (DLNSEO) funds Boren Scholarships and Fellowships for undergraduate and graduate students abroad to improve their cultural and language skills in areas critical to national security. In exchange for financial assistance, students must agree to work for the federal government for one year after completing the program. DLNSEO asked CNA to examine how the Boren program influenced awardee's career paths, and how their careers have developed since completing their service requirement. Our results indicate that Boren scholars and fellows feel that the skills and perspectives gained through the program—such as language proficiency and regional expertise—have been highly influential in their careers; however, fewer respondents felt that the resources gained through the Boren program—such as special hiring authorities and Boren Awards name recognition—were as influential.

Is the Fiscal Climate Affecting Joint Military Education?

The Chairman of the Joint Chiefs of Staff was concerned that the quality of joint professional military education (JPME) was suffering, or could suffer, given the current fiscal climate. This led the Joint Force Development Directorate (J7) to ask CNA to do a quick-look analysis of the state of JPME. Overall, we found that the quality of both JPME and its students has been maintained despite budget cuts.

Helping Students Get Good Jobs and Employers Get Good Workers

The need for education and training in various industries can differ significantly within a state. In ongoing work for the Northeast Tennessee College and Career Ready Consortium, a CNA team examined the state's 16 high school career and technical education (CTE) "career clusters" (—groups of courses that prepare students for the workplace or for postsecondary studies in a particular field) mapping them to projections for high-growth and high-wage jobs in Tennessee from 2012–2020. The team first mapped two regions, and is expanding the effort to the entire state. Also, data on the "supply side" are being added to show how many schools offer a CTE concentration in a certain career cluster and how many students complete concentrations in a

particular cluster. CNA is doing a similar project for the Florida.

Issues and Needs in Middle Appalachia: 1995–2015 and Tomorrow

CNA conducted a review of data and studies from 1995 to 2015 on the educational challenges to college and career readiness that are unique to Middle Appalachia. The review focuses on five topics we identified as particularly relevant: college and career aspirations, opportunities, and outcomes; educator effectiveness; curriculum and instructional access and quality; systemic capacity; and the emerging issue of health and wellness. The research highlights the importance of forming regional partnerships in order to develop systemic capacity for improving teaching and learning, with regional postsecondary institutions playing a pivotal role in lending expertise and resources. An emerging area for research is related to how school districts in middle Appalachia are addressing increasing problems of obesity and substance abuse among students.

Evaluation of the Connecticut Health and Life Sciences Career Initiative (HL-SCI)

CNA is leading the third-party evaluation of HL-SCI, a statewide initiative (funded by a grant from the U.S. Department of Labor) to prepare workers for high-wage, in-demand jobs in health and life sciences. Program components, delivered by a consortium of five community colleges and two colleges/universities, include: associate degrees and certificate programs aligned with regional labor market needs; online supplemental instruction in math and science; online and combined online/traditional classroom courses; a standardized system of assessing/awarding credit for prior learning; and enhanced internship and job placement services.

CNA is using several methods to assess the implementation and effectiveness of HL-SCI. Initial, first-year findings indicate that students in the program were generally satisfied with their courses and programs of study and believe that HL-SCI has the potential to change their lives for the better. However, these students reported having trouble balancing coursework with career and family responsibilities, and wanted more career guidance.

Implementation and Challenges of Online and Distance Learning

CNA Education operates the Regional Educational Laboratory (REL) Appalachia—one of a network of ten laboratories funded by the U.S. Department of Education—which provides technical assistance and research support to educators and policy-makers in Kentucky, Tennessee, Virginia, and West Virginia.

Rural schools, like those covered by REL Appalachia, often use online and distance learning instruction to offer courses that would otherwise not be available. The Southwest Tennessee Rural Education Cooperative (12 mostly rural districts surrounding Memphis) wanted to learn more about the use of online and distance learning in their area's high schools. In response, REL Appalachia analysts conducted a survey of high schools within the cooperative to ask why, how, and to what extent those types of learning were used in 2012-13, as well as what courses were offered and what the schools perceived as barriers to offering more online and distance learning courses.

The findings from this study, published in the report *Online and distance learning in Southwest Tennessee: Implementation and Challenges,* can help district leaders in the cooperative and other rural areas make strategic plans for using online and distance learning courses. Because the report also contributes to the limited research base on online and distance learning courses in rural school districts, it can be useful to a wider audience interested.

REL Workshops for Educators in Appalachia

This fiscal year, the REL Appalachia, operated by CNA held nine workshops to help educators in the region meet the challenges they face:

- *Five Steps for Structuring Data-Informed Conversations and Action in Education.* Nashville, TN, October 2014.
- *Action Planning for School-Wide Student Engagement Strategies.* Roanoke, WV, November 2014.
- *Uncovering the Sources of Student Learning Challenges: Analyzing and Interpreting Data.* Roanoke, VA, December 2014.
- *Principal Leadership for Effective Use of Professional Growth and Effectiveness System (PGES) Data.* Louisville, KY, December 2014.
- *Using Data to Improve Instructional Practice to Tackle Student Learning Challenges.* Roanoke, VA, April 2015.
- *Principal Leadership Strategies for Promoting Teacher Data Use.* Nashville, TN, June 2015.
- *Understanding the West Virginia Growth Model.* Morgantown, WV, June 2015.
- *Improving Teaching and Learning through Action Research.* Hazard, KY, June 2015.
- *Teaching Academic Content and Literacy to English Learners.* Erlanger and Louisville, KY, July 2015.