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BETTER OUTCOMES FOR AT-RISK KIDS

HOW THE CHILD-WELFARE SYSTEM COULD PROTECT MORE CHILDREN AND SAVE BILLIONS OF DOLLARS
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70 YEARS of innovation at RAND

Security at the **SOUTHERN BORDER**

RAND Picks Five

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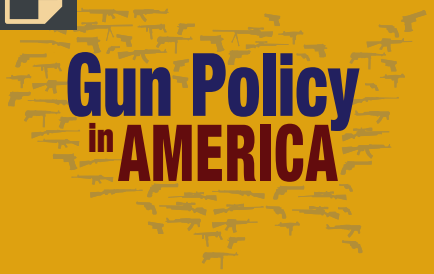

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1. Gender Integration in Air Force Training
The U.S. Air Force is reevaluating the degree of gender-integrated training (GIT) in basic military training. This report identifies five options for increasing GIT and presents a framework for monitoring the implementation of GIT over time.

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2. Gun Policy Comparison Tool
This tool allows users to explore how outcomes might change in each state and nationally if different combinations of gun policies were enacted or repealed nationwide. The results can also illustrate the trade-offs created when a group of policies improves one set of outcomes but undermines others.

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Colleges and universities have an opportunity to adopt meaningful changes, beginning with the creation of a system for tracking the prevalence of sexual assaults on campuses nationwide.

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4. Truth Decay
In this conference call with RAND supporters, political scientist Jennifer Kavanagh and RAND's president and CEO, Michael D. Rich, discuss the diminishing role of facts and analysis in American public life.

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5. Supporting Military and Veteran Caregivers from All Eras
In testimony submitted to the House Committee on Veterans' Affairs in February 2018, senior behavioral scientist Terri Tanielian describes specific opportunities to improve existing programs that support military and veteran caregivers.

MORE AT
www.rand.org/t/CT487

1. U.S. AIR FORCE PHOTO BY JOSHUA RODRIGUEZ; 2. RAND CORP; 3. WILDPIXEL/GETTY IMAGES; 4. OLM2650/GETTY IMAGES; 5. DORI WALKER/RAND PHOTOGRAPHY

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6 **Building a Better Child-Welfare System** What research says about preventing child abuse and neglect and improving the lives of children in the system

Amnoni Myers, left, shown here with her mentor and high school principal, Dr. Barbara Ferrer, grew up in the foster-care system. She recently graduated with her master's degree in public administration, works as a consultant, and is a tireless advocate for foster youth. A recent RAND report showed that a greater focus on preventing child maltreatment, and on placing children with relatives rather than strangers, could improve the lives of thousands of children like her.

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Research
Briefly

Adolescents and Anti-Tobacco Posters

Teenagers at high risk for smoking were more likely to say they would try a cigarette after seeing a gruesome picture of a tobacco-diseased mouth.

The finding, from a unique RAND experiment, calls into question a tactic often suggested as a way to counter Big Tobacco where it matters most, at the checkout stand.

For a few years now, RAND has operated a fake convenience store in a Pittsburgh office park. The store looks in every way like the real thing, even down to the coffee on the burner. Researchers use it to test anti-smoking initiatives in as close to real-world conditions as possible.

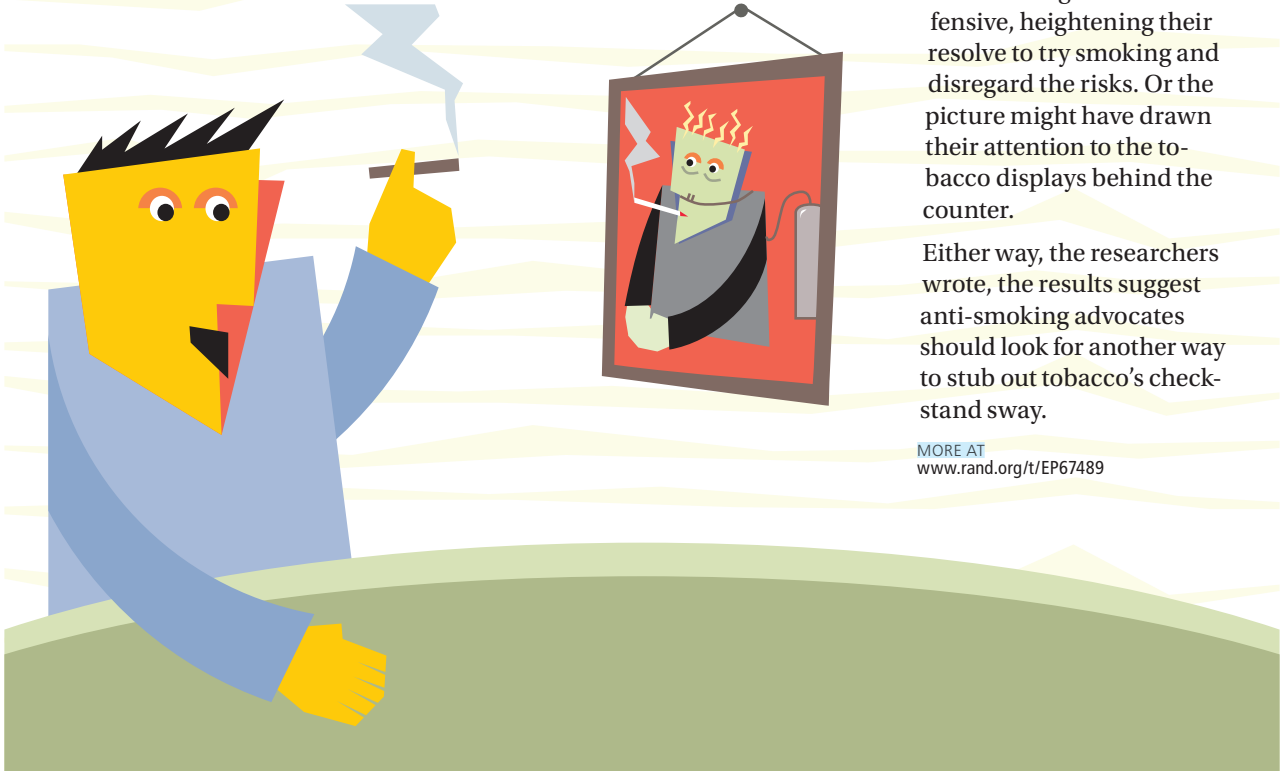
The focus of their latest study was a close-up picture of a diseased mouth and gums with the warning, "Cigarettes cause cancer." Anti-smoking groups have pushed for such graphic warnings as an answer to the hundreds of millions of dollars that tobacco companies spend on check-stand advertisements and displays.

The researchers recruited more than 400 teenagers to "shop" in the store as if it were any other convenience store. About 20 percent of the teens had said before the experiment that they might try a cigarette in the future. Afterward, those at-risk teens who saw the graphic warning ranked themselves as more susceptible to smoke than those who didn't.

That was the opposite of what years of anti-smoking messaging sought to accomplish. It's possible the graphic warning put those teenagers on the defensive, heightening their resolve to try smoking and disregard the risks. Or the picture might have drawn their attention to the tobacco displays behind the counter.

Either way, the researchers wrote, the results suggest anti-smoking advocates should look for another way to stub out tobacco's check-stand sway.

MORE AT
www.rand.org/t/EP67489



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Do Medical Marijuana Laws Reduce Opioid Overdoses?

The link seemed compelling, even lifesaving: In states that legalized medical marijuana, the death rate from opioid overdoses fell.

But that's only part of the story, a recent RAND study found.

States with medical marijuana laws on the books did see decreases in opioid mortality, the researchers confirmed—even as the rest of the nation slid into an epidemic of opioid overdoses. But that trend has weakened in recent years, as both the laws and the nature of the epidemic have changed.

Laws passed after 2010 had almost no impact on opioid mortality, the researchers found. The timing was significant: That was right after the federal government said it would not prosecute states that allowed medical marijuana—as long as they regulated its distribution.

In fact, it wasn't legalized marijuana itself that reduced opioid mortality, the researchers concluded, but easy access to marijuana through loosely regulated dispensaries. Laws passed after 2010 tightened up those regulations, making it harder to get medical marijuana.

When the researchers accounted for those differences, they found that dispensaries reduced opioid mortality rates by about 20 percent. The effect of just having legalized medical marijuana, without promoting access through dispensaries, was statistically zero.

At the same time, the opioid epidemic itself has changed, and that might also explain the diminishing impact of medical marijuana on overdose rates. Once dominated by prescription painkillers, the epidemic has shifted since 2010 toward illicit opioids like heroin and fentanyl. People addicted to those drugs might not see marijuana as an effective substitute.

"Our research suggests that the overall story between medical marijuana and opioid deaths is complicated," said study coauthor Rosalie Liccardo Pacula, a senior economist at RAND and codirector of the RAND Drug Policy Research Center. "Before we embrace marijuana as a strategy to combat the opioid epidemic, we need to fully understand the mechanism through which these laws may be helping and see if that mechanism still matters in today's changing opioid crisis."

MORE AT
www.rand.org/t/EP67480

Making Older Adults a Higher Priority

When disaster strikes, older people are often among the most vulnerable. A recent RAND study identified an opportunity for communities to help their older residents survive and recover—one that had gone almost entirely unnoticed.

More and more older Americans are choosing to participate in senior villages that help them live independently in their homes. But researchers found little evidence that public-health departments have included those communities in their disaster-resilience efforts.

That could be a costly oversight. Older people are more likely to live alone and have physical limitations and medical needs, all of which can make disaster preparedness a matter of life and death. Half of the people killed in Hurricane Katrina were 75 or older; nearly two-thirds of the people who died during a 1995 Chicago heat wave were 65 or older.

Yet few of the senior villages and other age-friendly communities the researchers surveyed went beyond handing out preparedness pamphlets and reminding their residents to check their smoke alarms. And none of the public health departments they interviewed offered preparedness activities specific to older adults.

The researchers created an interactive guide to help bring together health departments and age-friendly communities. Even just expanding preparedness classes to older adults and ensuring that preparedness information is accessible to them could significantly improve their resilience.

That will be especially important in the coming years, the researchers wrote, for a few reasons. Storms and other weather disasters are becoming more frequent with climate change, as the proportion of older adults soars with the aging of the Baby Boomers. And their experience could be a valuable resource in a disaster—if they've prepared for it.

MORE AT
www.rand.org/t/RR2313

SEE THE TOOLKIT
www.rand.org/pubs/tools/TL282

TOP: MTLAPCEVIC/GETTY IMAGES AND CREATIVE-FAMILY/GETTY IMAGES; BOTTOM: PHOTKA/GETTY IMAGES AND GRYNOLD/GETTY IMAGES

Osonde Osoba works at the leading edge of artificial intelligence (AI). His recent work explores society's growing reliance on autonomous machines, and what it means for security and the future of work. He also has highlighted concerns that algorithms too often rely on historically biased data, preserving and extending those biases in everything from criminal sentencing to mortgage approvals to credit access. He was introduced as the "engineer of fairness" at a recent TEDx talk. Osoba grew up in Nigeria, earned his Ph.D. in electrical engineering at the University of Southern California, and came to RAND first as a summer associate in 2012 and then as an engineer in 2014.

The Human Side of Artificial Intelligence

It's less about the intelligence and more about being able to capture how humans think.

Q You created an AI algorithm when you were 15?

A It was a terrible idea. I was bored and my mom sent me to this computer course at a local university. I learned to program for the first time, I learned logic for the first time. I figured, maybe I could create a program that could parse arguments and get a sense for when they are cogent, valid, and persuasive. I underestimated how hard it is to do natural-language processing.

What was it about AI that caught your imagination?

It's less about the intelligence and more about being able to capture how humans think. I wasn't trying to create general intelligence; I was trying to better understand how people think about argument, what makes an argument. Artificial intelligence is a way of understanding what it means to be human beings.

What are the conversations we should be having now, as a society, that we're not?

We need to think about AI in terms of value alignment—I think that's a better framework than, say, fairness and bias. You create this algorithmic decision-making agent, and to what extent does it align with what the general population or with what the culture deems valuable and important? At the moment, most of the work on AI comes from a technical point of view, so it's focused on making it as precise and

DIANE BALDWIN/RAND PHOTOGRAPHY

accurate as possible. But that's not the primary objective of most human interactions with the world. There are countless other things to which we need to pay attention.

When you look 5–10 years out, what are we going to be talking about in terms of AI?

I think the concept of privacy will continue to change to reflect whatever technology we have. That doesn't mean I think privacy is irrelevant or that it's necessarily going to degrade over time. But we're going to have to be more sophisticated in how we talk about privacy. Maybe we talk more about variety in the types of privacy that apply to different contexts.

Artificial intelligence, algorithms, are only going to get more sophisticated, and so applying them to social media, to information dissemination, to achieve strategic ends—that's going to get more sophisticated. I think when we look back at what the U.S. intelligence community has concluded were Russian attempts to intervene in the 2016 presidential election, we'll probably think those are child's play. I would bet money that there's going to be escalation on that front.

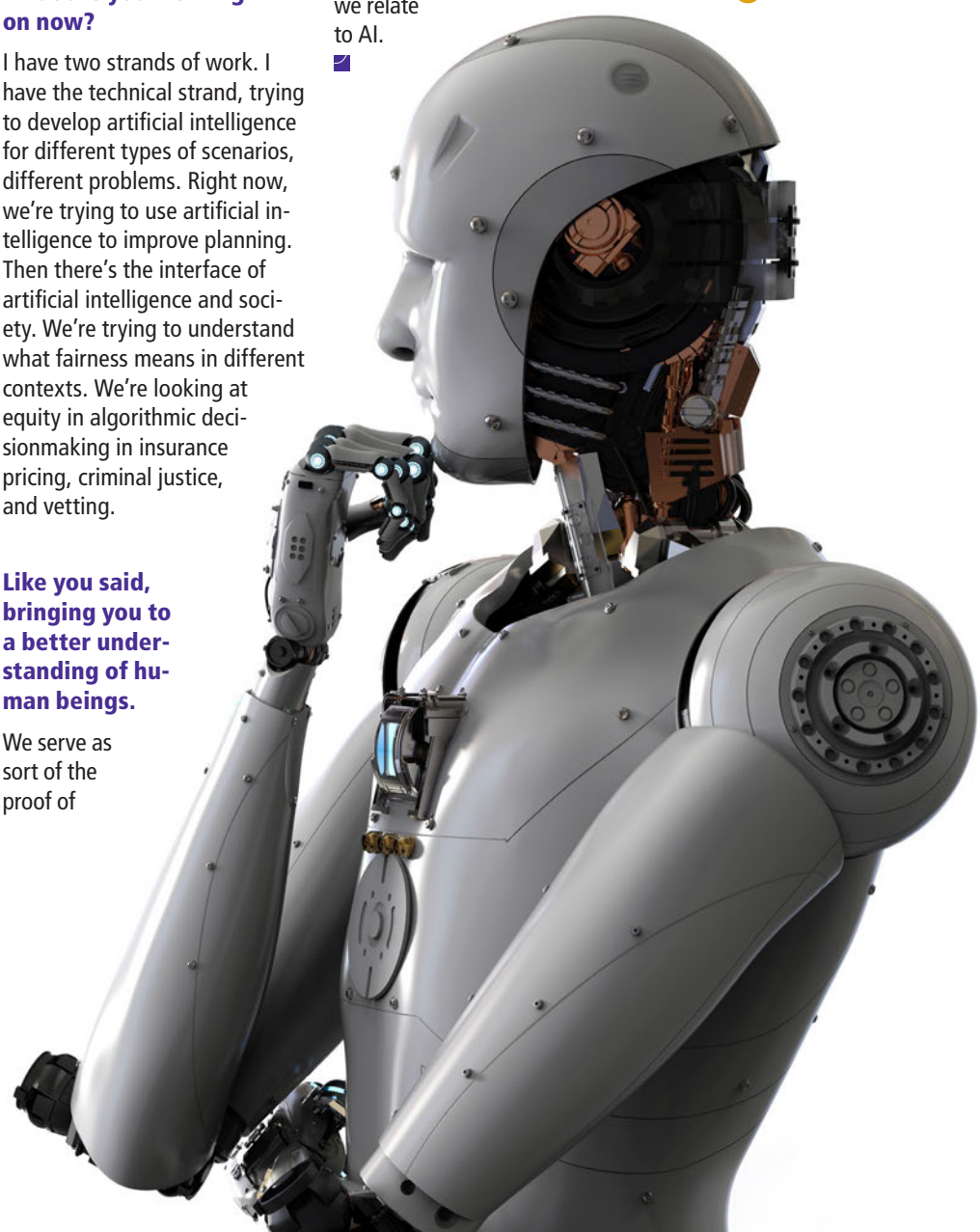
And then, if you're being a little playful, I wonder what level of intelligence would be required before we start thinking of autonomous systems less as this "other" and more as parts of our society. People are already having such conversations about, say, liability: If we treat these systems as entities unto themselves, that allows us to better consider how issues of liability play out. A fellow researcher tells a story about how, several years ago, Sony created this artificial pet called AIBO that people actually bought and used as pets. At some point, Sony had to discontinue support for AIBO, and people had these systems that started dying or degrading, and people actually started mourning the death of their AIBO. So you can imagine what happens when you extend that to even more intelligent systems.

What are you working on now?

I have two strands of work. I have the technical strand, trying to develop artificial intelligence for different types of scenarios, different problems. Right now, we're trying to use artificial intelligence to improve planning. Then there's the interface of artificial intelligence and society. We're trying to understand what fairness means in different contexts. We're looking at equity in algorithmic decisionmaking in insurance pricing, criminal justice, and vetting.

Like you said, bringing you to a better understanding of human beings.

We serve as sort of the proof of what's possible, and so understanding how we act is going to be useful in understanding how to create better artificial intelligence systems. That's the technical line of reasoning. But another reason to focus on human behavior is because we create these things as tools. They exist to be used within human society. And so we need to know how they interact with human society, with human norms, and that requires us to study human behavior and how we relate to AI.



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A FOCUS ON THE RESEARCH OF
Jeanne S. Ringel, Dana Schultz, Joshua Mendelsohn, Stephanie Brooks Holliday, Katharine Sieck, Ifeanyi Edochie, and Lauren Davis

Building a Better Child-Welfare System

By Doug Irving, Staff Writer

America's child-welfare system could save billions of dollars while helping more families and protecting more children from abuse and neglect, a recent RAND study concluded.

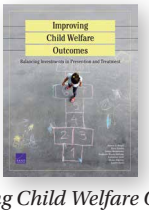
The study provides a first-of-its-kind look at how the system works, and how it could work better. It found that a greater emphasis on preventing maltreatment before it happens, and on keeping children within their own extended families when it does, could improve the lives of thousands of children every year.

"Together, those two things really have an impact," said Jeanne Ringel, a senior economist and director of the Population Health Program at RAND, who led the study. "That's the exciting part: If you do them together, you achieve all of your objectives, and you do it with less money."

AMNONI MYERS RECENTLY EARNED A MASTER'S DEGREE IN PUBLIC ADMINISTRATION. GIVEN UP TO THE CHILD-WELFARE SYSTEM AT THE AGE OF 12, SHE NOW WORKS AS A CONSULTANT, IN PART ON CHILD-WELFARE ISSUES, AND ADVOCATES FOR FOSTER YOUTH LIKE HER.

Amnoni Myers introduced First Lady Michelle Obama at a 2015 "Take Our Daughters and Sons to Work Day" event.

RAND's study sought to provide an objective look at how different policies could affect the system and children's lives.



Improving Child Welfare Outcomes: Balancing Investments in Prevention and Treatment is available for free download at www.rand.org/t/RR1775-1

The cost of trauma

To understand the child-welfare system, you have to see it through the eyes of someone like Amnoni Myers. She was 12 years old when her mother gave her up for good. No explanations, no goodbyes, just a social worker walking across the basketball court at her school, telling her to pack up her things.

By then, she had spent so much of her childhood locked in a family member's basement that she had come to think of it as home. She's the first to say she needed help. But she has also spent her life wondering what it would have been like if her mother had the support she so badly needed, and was able to keep her family together.

"What would that have looked like, if I had a family unit that was able to help me navigate life?" she says now. "When I think about my family, it was like three generations of abuse, neglect, abandonment, drugs, criminal engagement. But if you brought supportive things into the picture, I of course think things could have been better.

"It costs more to take a child out of the home than it does to keep a child in the home. Not just financially. It costs more emotionally. It's a disturbance; it's traumatic. You just always want somebody that can understand you, somebody that can be there for you. You want somebody that can love you."

Amnoni's is one story of growing up in the child-welfare system. There were, at last count, more than 437,000 others playing out in group homes or foster homes, or the homes of relatives who just stepped up when they needed help. Average age of those children in the system: 8 years old.

There's never been much question that the system could work better; the question has always been how. It costs around $30 billion a year to investigate abuse reports, counsel and support families, and provide foster homes for children at most risk. About half the money comes from the federal government, with legal strings attached that make it hard to use for anything other than foster care and other response services.

Child-welfare advocates have sought in recent years to shift some of the focus and funding toward preventing child abuse and neglect before it happens. They point to a growing body of research that has shown that carefully designed parenting programs and home visits can save families and keep children out of the system.

Investing in better outcomes

RAND's study sought to provide an objective look at how different policies could affect the system and children's lives. To do that, researchers created the most comprehensive model to date of how the system works, down to the key decision points—from maltreatment, to report, to investigation, to foster care. Then they plugged in different policy options and simulated the movement of millions of children into and through the system.

No single policy change hit every target: reducing the number of children suffering abuse and neglect, improving the lives and well-being of those who did, and at least holding the line on system costs. But the researchers identified a package of policies that did.

They found that investing more in prevention programs, and placing more children with relatives rather than foster families, could drive down episodes of maltreatment by about 4 percent. That meant less money spent on investigations and out-of-home placements, and better outcomes for the children involved—even into adulthood. They were several percentage points less likely to end up homeless, underemployed, drug-addicted, or in jail.

The package would require an up-front increase in spending on new services, but it reduced spending over time. The result would be a reduction in total lifetime costs of between 3 and 7 percent. That would

PHOTOS COURTESY OF AMNONI MYERS

mean savings of between $5.2 and $10.5 billion, from the current baseline of $155.9 billion

"It makes sense that, if we can keep families together, that is the best for children, and the best for society," said Jeanne Pritzker, the founder of the Pritzker Foster Care Initiative, which sponsored the RAND study. "Ideally, this will lead to more funds being channeled into helping parents, in the hopes that more families will stay together and fewer children will end up being separated from their parents—and thus avoid a cycle of trauma that often takes a lifetime to address."

Her foundation has worked with a tireless advocate for just that kind of change.

One woman's success

Amnoni Myers aged out of the system a decade ago, when she was 18—with a phone call telling her the state was no longer paying for her bed in a foster home. She found her clothes, her belongings, everything she owned stuffed into a dozen trash bags and dumped on the porch of the house she had called home for more than three years.

By then, though, she had something that too many children in the system lack: adult mentors—a teacher, a high school principal—who took her in, supported her, and helped her reach for opportunities. She pieced together the financial aid to put herself through college. She became an advocate for foster youth like her, which led her to Washington, D.C., which led to internships in the U.S. Senate and then in the White House. She introduced First Lady Michelle Obama during a 2015 "Take Our Daughters and Sons to Work Day" event.

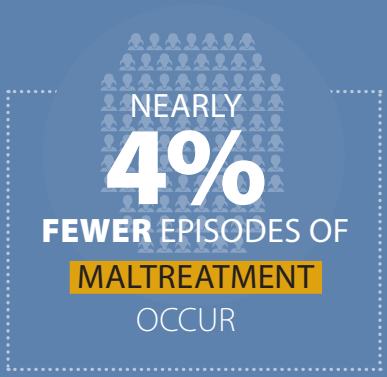
She recently earned a master's degree in public administration through the National Urban Fellows Program, where she was a fellow at the California Endowment. She works now as a consultant, in part on child-welfare issues, and continues to advocate for foster youth.

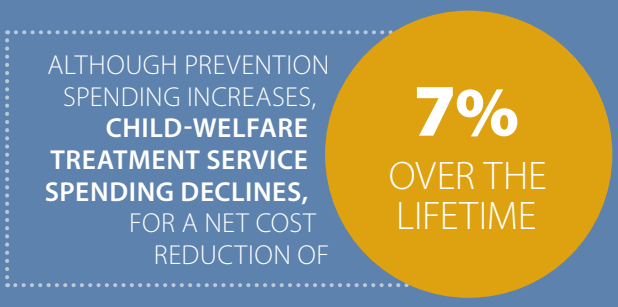
"What would it look like to actually provide services and empower these parents to know that they can do it?" she asks now. "Because I think that's where the chain can be broken. I look at myself: I now have that knowledge, so that when I do have kids, I guarantee they will not be in the foster care system. I know what I can do, and I have services and people around me that I know will be able to help."

VIOLETASTOCK/GETTY IMAGES

She still sees too many foster kids aging out of the system with their lives stuffed into trash bags or cardboard boxes. She has been working with a foster-youth organization in Washington to give those kids something she never had: the simple dignity of a suitcase.

The Benefits of a Balanced Approach Combining Prevention and Kinship Care





These results are based on the output of a RAND Corporation model. All statistics are for one cohort from birth to age 18.

Blas Nuñez-Neto is a senior policy researcher at RAND. Prior to joining RAND, he served as a senior advisor to the Commissioner of U.S. Customs and Border Protection.

BY
Blas Nuñez-Neto

Prioritizing Security at the U.S. Border with Mexico

The security of our southern border with Mexico has dominated the headlines since the 2016 election. Since then, a number of investments have been considered by Congress and the Trump administration—including building a wall, deploying new technology to the border, and hiring 5,000 new Border Patrol agents.

An effective approach to securing the border could begin by determining what U.S. authorities should focus on. While much of the public debate has focused on illegal immigration, drug smuggling is also an important part of the story. Setting clear priorities is important because, even with the increase in resources currently being considered, U.S. front-line personnel will never be able to stop every illegal immigrant or drug shipment from crossing the border. Infrastructure and technology can only be effective if they help front-line border personnel carry out a clearly defined mission.

TOP: DORI WALKER/RAND PHOTOGRAPHY; BACKGROUND: LIVING-LEARNING PROGRAMS/FLICKR

So what should U.S. priorities be at the border? When it comes to narcotics, Department of Homeland Security statistics show that hard drugs—such as cocaine, heroin, fentanyl—are predominantly smuggled through U.S. ports of entry, while marijuana is generally smuggled between ports of entry. This is in part due to logistics—hard drugs can be smuggled in small quantities, which allows them to be hidden in vehicle compartments or in luggage or swallowed by people and walked across the border. Marijuana, on the other hand, is bulky and hard to conceal—it is thus generally smuggled across the land border between ports of entry, or sometimes through tunnels or aboard high-speed boats.

Efforts to stop narcotics from crossing the border are complicated by the sophistication of drug smugglers. Mexican drug cartels have shown themselves to be relentless and flexible, easily adapting their smuggling tactics and strategies to whatever front-line personnel are doing at any given part of the border. When fences are built, they go around them, over them, or under them. When sophisticated X-ray machines are deployed, they find new ways to conceal their drugs that are harder to detect. And they are always watching front-line personnel to pick up on tendencies, time their deployments, and identify individuals they might be able to corrupt.

When it comes to illegal immigration, the number of people actively trying to avoid detection at the border is at an all-time low—and many people trying to enter the country without authorization are actually turning themselves in to claim "fear" and enter the asylum process. In fact, over the past few years, increasing numbers of inadmissible people are going directly to U.S. ports of entry to claim fear, which has stressed operations at facilities that were never intended to hold large numbers of people for a long time. As I've noted elsewhere, the nature, scale, and scope of illegal immigration has fundamentally changed—but the political debate about immigration has not.

So what do these trends mean for the proposed investments in border security that the administration and Congress are considering? Given that the country is in the midst of an opioid epidemic so severe that the administration has designated it a national emergency, stopping fentanyl and heroin from crossing the border might be a higher priority than stopping marijuana—a drug that a number of states have legalized.

Policymakers could consider investing in improvements to the ability to detect narcotics at ports of entry, the common entry point for the most dangerous drugs. For example, front-line personnel currently lack an easy way to identify fentanyl, a key driver of the current epidemic. When making investments between the ports of entry, policymakers should keep in mind that U.S. adversaries—the Mexican drug cartels—are ruthless and endlessly adaptive. For this reason, policymakers may want to focus on technologies that are flexible and relocatable on the land border, so that Border Patrol agents can easily adapt to the latest cartel strategy.

Lastly, many people crossing the border illegally today—almost 80,000 in fiscal year 2016 alone—are not trying to evade detection, so enhanced border protection will not stop them. Rather, they are taking advantage of incentives created by the U.S. asylum process and the long backlogs in the U.S. immigration court system to enter the United States at ports of entry. Any proposed approach that doesn't address these structural issues in the U.S. immigration system in a way that is humane to those who are genuinely in danger, but also recognizes the U.S. national prerogative to maintain secure and sovereign borders, is not likely to yield a long-term solution.

Infrastructure and technology can only be effective if they help front-line border personnel carry out a clearly defined mission.

As debate on border security continues, policymakers would be wise to look beyond the heated rhetoric to clearly identify priorities and make informed decisions about how best to deploy finite resources to get the strongest security for the investment.

A version of this commentary appeared on U.S. News & World Report in January 2018.

1948 2018
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70 Years of Innovation

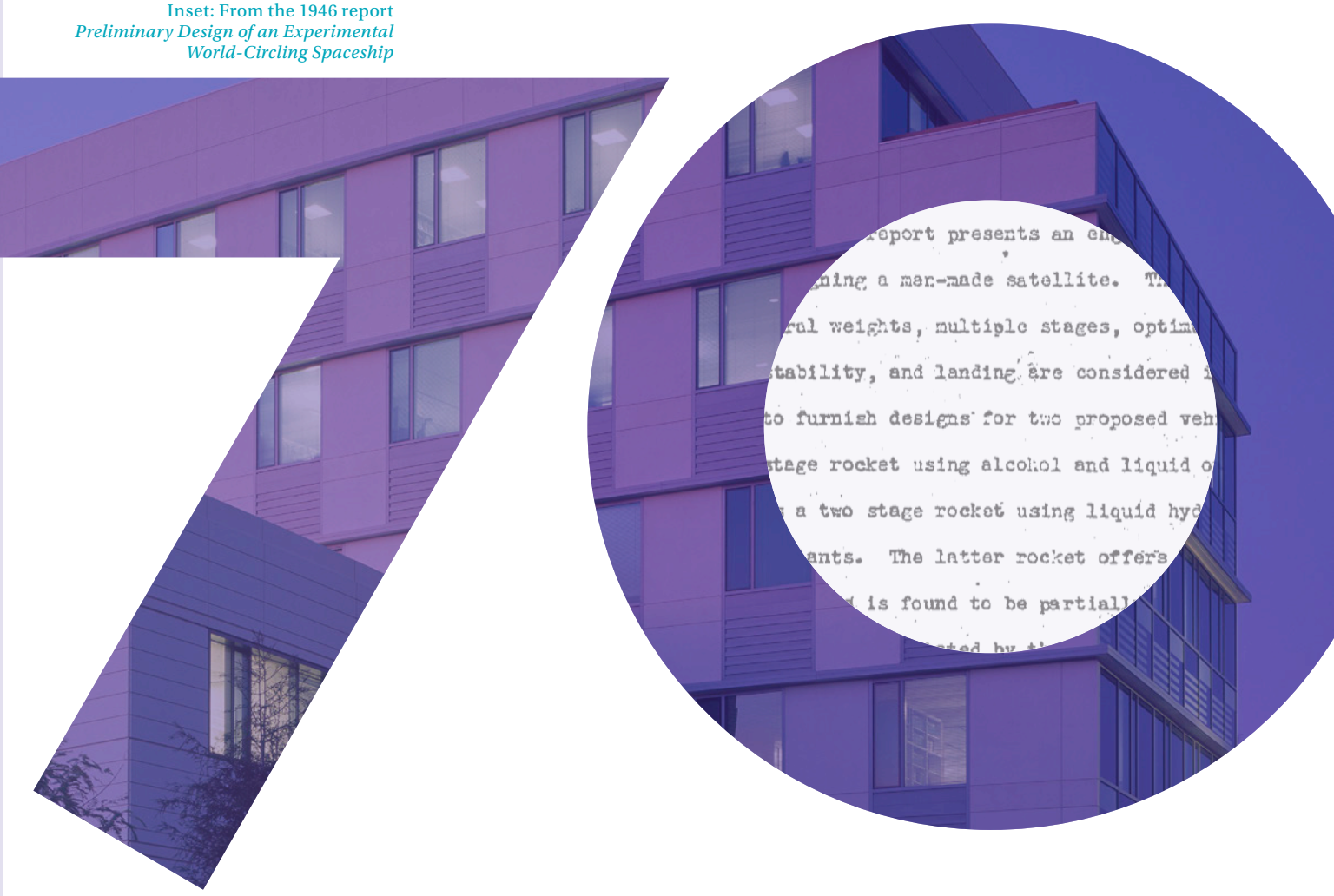
By Doug Irving, Staff Writer

It's been 70 years since a small group of researchers decided to expand beyond their Air Force contracts and establish the independent RAND Corporation.

Their aim, as they explained in the articles of incorporation: "To further and promote scientific, educational, and charitable purposes, all for the public welfare and security of the United States of America."

Within that mission, RAND researchers supported the early development of videotape, and invented one of the first email systems. They helped establish GPS as a public good, which is why your phone can now route you around a traffic jam. They provided the intellectual groundwork for the internet.

RAND has issued more than 23,000 public research reports and other publications in its 70 years. Here are four of its projects that changed the world.



Inset: From the 1946 report *Preliminary Design of an Experimental World-Circling Spaceship*

Videotape

By the 1950s, scientists at RAND were pushing the U.S. government to get a satellite into space. The first report RAND ever issued, in fact, had anticipated the Space Age: *Preliminary Design of an Experimental World-Circling Spaceship*. RAND scientists had worked out weights and velocities, fuels and trajectories. But they had a problem.

The satellite's main purpose would be reconnaissance, especially of the Soviet Union. The scientists wanted to record video images onto a storage tape, and then beam the images to the ground. But nobody had figured out how to record video with anywhere near the quality they would need.

RAND began working with a California company called Ampex. It had worked with crooner Bing Crosby to perfect audio tape recording and was starting to experiment with video. In 1956, as part of a secret satellite program known as Project Feed Back, RAND contracted with Ampex to develop a system that could record higher-resolution video on magnetic tape.

RAND and Ampex eventually concluded that such a system would require advances in tape recording that were still on the horizon in the mid-1950s. But during their partnership, Ampex completed and introduced the world's first commercially successful videotape recorder. It wasn't strong enough to capture Soviet activities from space, nor small enough to fit in a satellite—but it forever changed the evening news and launched a new era of videotape.

The Soviet Union beat the United States into space a few months later with its first Sputnik satellite. Racing to catch up, the U.S. redefined Project Feed Back to incorporate another RAND idea, a satellite that could drop its surveillance images back to Earth in recoverable packages, rather than store and transmit them. That influenced the development of the CORONA program, which sent 121 satellites into space between 1960 and 1972.

The internet

Paul Baran was trying to solve a question of the Cold War: How to keep official lines of communication open in the devastated aftermath of a nuclear attack. His answer helped provide a framework for the internet.

At the time, in the early 1960s, messages zipped from Point A to Point B through a series of central switches. Break a switch, and the message stopped. Baran envisioned a grid of smaller, high-speed transmission nodes. His idea was to break each message into digital data blocks, and then send each block into the grid to find its fastest way to the destination. There, the blocks would be reassembled into the full message.

Baran compared it to a game of hot potato. Each node would toss its message block to the next available node as quickly as possible. Even if several nodes were destroyed, the message blocks would simply bounce to other nodes and work their way around the broken links.

He presented his ideas in 1961, and later compiled them into a series of reports (a "frightening pile" of paper, he admitted in the introduction). At least one other researcher, a British scientist, had come to similar conclusions at around the same time. He called it "packet switching." A few years later, the Defense Department's Advanced Research Projects Agency put their concepts into action, building an early network that it called the ARPANET.

That evolved into the internet we have today. Its basic architecture still relies on the idea of a distributed network that can find the fastest route for packets of information.

Baran was always modest about his contribution. He once compared the internet to a cathedral, built by many hands over many years. "New people come along and each lays down a block on top of the old foundations, each saying, 'I built a cathedral.'

"If you are not careful," he added, "you can con yourself into believing that you did the most important part. But the reality is that each contribution has to follow onto previous work. Everything is tied to everything else."

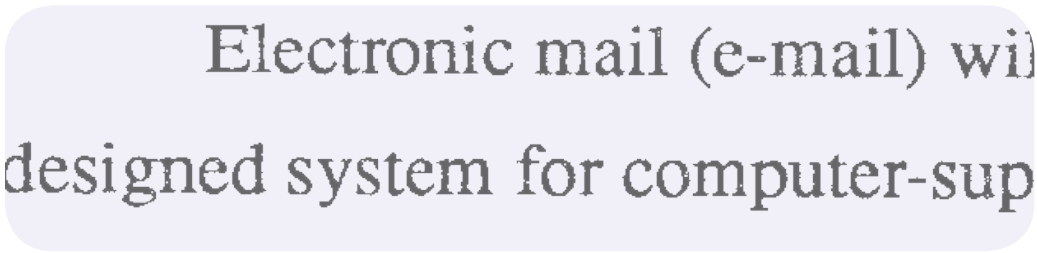
E-mail

It took little more than a few weeks in 1978 for RAND scientists to create what would become one of the most popular and influential email programs on the early internet. They called it MH, for Mail Handler, and it was so ahead of its time that even today, in our era of e-everything, some users still swear by it.

MH ran on Unix, the most advanced operating system at the time, and its genius was in treating mail messages like any other text file. That meant they could be saved, organized, searched, and sent with simple commands, without opening a separate email browser.

It never had the name, fame, or commercial success of an AOL or Gmail. But as a freely available, public-domain tool, MH built a loyal following of tens of thousands of users over the years. It was the email of choice for researchers and analysts in the early days of the ARPANET, influencing an entire generation of network engineers. Its descendent, now known as NMH, for New MH, was updated as recently as this year.

"It's the best email system around," said Norman Shapiro, a longtime RAND mathematician who helped create MH. He still uses it every day and considers it his greatest intellectual achievement. "It's probably had more impact than anything else."


Electronic mail (e-mail) wi

designed system for computer-sup

From the 1979 RAND report *The MH Message Handling System*

RAND's interest in email didn't stop there. In the mid-1990s, researchers proposed a national universal email system. They recommended that every U.S. resident be given an email address, with public access to computers and economic assistance for those who couldn't afford network access.

RAND also published an early book of email etiquette in 1985. Sample advice: "Avoid responding while emotional" and "Sarcasm, humor, and irony often do not work." Its authors, including Shapiro, lamented inboxes filled with unwanted notices about "cheese buying clubs, upcoming ski trips, and so forth," and advised senders to limit the proliferation of junk email: "Shoot with a rifle, not a shotgun."

GPS

Shortly after midnight eastern time on May 2, 2000, GPS receivers around the world picked up something extraordinary. Until then, the signals available to civilian receivers had always been distorted a little too much to make them reliable way-finders. But in those opening minutes of May 2, the commercial signals suddenly tightened into the precise beacons we know today.

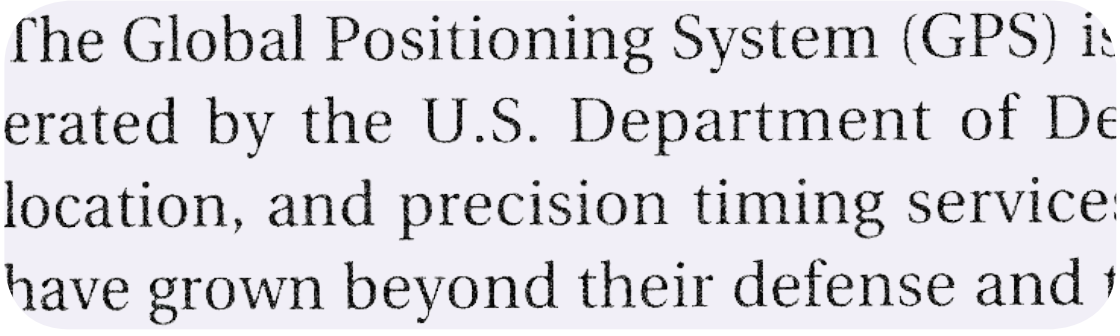
It wasn't a technological breakthrough, but a policy one—and it was based in large part on a RAND study.

The satellites that make up the Global Positioning System were made for military use. As they circle the Earth, they broadcast their time and location; RAND's report called them "clocks in space." A GPS device on the ground can use that basic information to calculate how long a satellite's signal took to reach it, and therefore how far it is from that satellite. With signals from at least four satellites, a GPS device can pinpoint its location anywhere on Earth.

But the satellites had always sent two different signals: a precise one for the military, and a somewhat scrambled one for civilian use. The idea was to keep enemy forces from using U.S. technology against the U.S. In the mid-1990s, though, the White House asked RAND to study GPS policy in general, including that signal scrambling, known as "selective availability."

The resulting report, issued in 1995, ran to nearly 400 pages with appendixes. It found little evidence that selective availability was impeding the commercial development of GPS, but also little evidence that it was still a military necessity. More important, the report concluded, was the need for a clear statement from the U.S. that it would continue to fund and maintain the GPS system as a global gold standard.

A few months later, the White House issued just such a policy statement, pledging to maintain GPS for the future, free of user fees, and with a plan to eventually dial selective availability to zero. It made good on that promise just after midnight on May 2, 2000, instantly increasing the precision of the civilian signal by a factor of ten. GPS now helps regulate the flow of energy through the electric grid, provides time stamps for world financial transactions—and helps any number of rush-hour commuters find the quickest way home.



Top: RAND office, circa 1960. Inset: From the 1995 RAND report *The Global Positioning System: Assessing National Policies*

"It had all the characteristics of what makes a RAND report," said Scott Pace, who led the study and is now the executive secretary of the National Space Council. "It took an objective, multidisciplinary, national-level view of the problem. It didn't try to focus just on the technology or just on the politics. It tried to answer the big questions: What does this mean? What are the options?"

Above all, it sought to balance—in the words of RAND's founders—the public welfare and security of the United States.

In the 70 years since RAND incorporated under that promise, its researchers have gone from working out calculations by hand to studying advanced artificial intelligence and autonomous vehicles. Its focus has expanded from the philosophical underpinnings of the internet to the very real threat of "truth decay" that the modern internet has made possible. The same objective, multidisciplinary approach it took to GPS now guides its analysis of everything from child welfare to health insurance to gun policy in America.

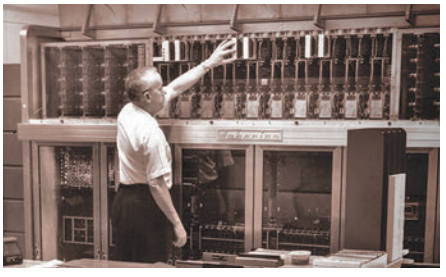
It's like building a cathedral, as Paul Baran once said: Each contribution builds on those that came before. "Everything is tied to everything else."

Major sources for this article included the following RAND publications: *RAND and the Information Evolution: A History in Essays and Vignettes* by Willis H. Ware (2008); *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related U.S. Space Technology* by Merton E. Davies and William R. Harris (1988); and *Sixty Ways RAND Has Made a Difference* (2008); as well as "How RAND Invented the Postwar World" by Virginia Campbell (*Invention & Technology,* 2004); *Project Air Force, 1946–1996* by David Jardini; *History of the Early Days of Ampex Corporation* by John Leslie and Ross Snyder (Audio Engineering Society, 2010); the U.S. government website gps.gov; and the *New York Times* obituary "Paul Baran, Internet Pioneer, Dies at 84" (2011). Other sources include the following original RAND research reports: "Wide-Band Magnetic Tape Recorder" by Ampex Corporation (1957); the "On Distributed Communications" series by Paul Baran (1964); *The Design of the MH Mail System* by Robert H. Anderson, Norman Z. Shapiro, Tora K. Bikson, and Phyllis H. Kantar (1989); and *The Global Positioning System: Assessing National Policies* by Scott Pace, Gerald Frost, Irving Lachow, David Frelinger, Donna Fossum, Donald K. Wassem, and Monica Pinto (1995).

1948 2018 70 RAND CORPORATION

1940s

46 **First Satellite Design** | *Preliminary Design of an Experimental World-Circling Spaceship*, the first report from Project RAND (before it separated from Douglas Aircraft Company in 1948 and became an independent, nonprofit organization), was at the time the most comprehensive engineering study of the nuts-and-bolts realities of a satellite spacecraft.



48 **The JOHNNIAC** | The need for solutions to complex analytic studies outstripped the computing power available, so RAND built its own computer. Named after mathematician John von Neumann, the JOHNNIAC was one of the first mainframe computers with stored memory.

50 **Soviet Studies** | RAND pioneered the field, beginning in 1950 with *The Operational Code of the Politburo*.

52 **Cost Analysis and Logistics** | RAND produced the first program-based budget for the U.S. Air Force and developed the basic concepts of total force cost analysis.

54 **Selection and Use of Strategic Air Bases** | A team of RAND researchers shook the foundation of nuclear deterrence policy by shifting the U.S. from a first-strike to a second-strike posture. The team suggested placing air bases in the U.S. and relying on long-range bombers and aerial refueling aircraft, eventually saving the Air Force billions of dollars.

1950s

57 **Artificial Intelligence** | The first successful AI program that used Information Processing Languages (IPLs) was developed at RAND. IPLs were the precursors of popular contemporary languages such as LISP.

58 **Reconnaissance Satellite Systems** | RAND researchers designed components of the first successful U.S. satellite imagery reconnaissance system. CORONA satellites took pictures of military targets and returned the exposed film back to Earth in reinforced capsules. By eliminating the guesswork regarding military arsenals of nations around the world, the CORONA satellite program served as a deterrent against the outbreak of war.

55 **A Million Random Digits with 100,000 Normal Deviates** | This book is still the largest source of random digits and normal deviates used by statisticians, physicists, poll takers, lottery administrators, and quality control engineers.

73735 45963 78134
02965 58303 90708
98859 23851 27965
33666 62570 64775
81666 26440 20422

15838 47174 76866
89793 34378 08730
78155 22466 81978
16381 66207 11698
75002 80827 53867

99982 27601 62686
84543 87442 50033

LEFT: RAND CORPORATION/RAND ARCHIVE; RIGHT: PUBLIC DOMAIN, U.S. MILITARY SATELLITE IMAGERY

61 **The RAND Tablet** | This was one of the first devices permitting the input of handwritten text and freehand drawings into a computer. Although limited in its capabilities and too expensive for commercial use, the Tablet paved the way for PalmPilots, Tablet PCs, and iPads.

1960s

62 **Seed of the Internet** | RAND developed a plan for a communication network that would withstand a nuclear attack. This notion of distributed communications, or packet switching, eventually became the foundation of the Internet.

64 **NATO Force Planning** | RAND research led to formation of the NATO Defense Planning Working Group, the first NATO contingency studies, the preparation of NATO Planning Guidance, and the NATO Flexible Response defense strategy.

66 **Viet Cong Studies** | In the mid-1960s, RAND research teams studied "motivation and morale" among cadres of Viet Cong. Some 2,000 interviews were conducted with Viet Cong prisoners and defectors. The studies identified repression as a vital part of the overall enemy effort to erode South Vietnam government strength.

70 **Graduate School Established** | Founded as one of eight graduate programs created to train future leaders in public policy, the RAND Graduate Institute (now the Pardee RAND Graduate School) is the largest public policy Ph.D. program in the nation.

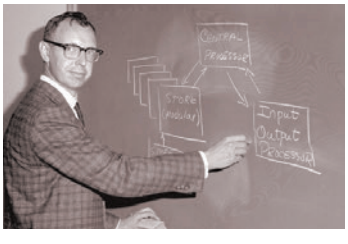
71 **The All-Volunteer Force** | As the U.S. was transitioning from the draft to an all-volunteer force, RAND established a manpower research center comprising economists, cost analysts, operations researchers, and computer scientists, whose efforts developed the analytical underpinnings that have since been used to test and adjust the Department of Defense's volunteer force–related policies.

75 **Racial Differences in Income** | RAND examined the main drivers of the post–Civil War economic status of black Americans. Periods of advancement were linked to periods where the schooling gaps between black and white Americans closed and the relative quality of black schools improved. These remain among the most cited references on the economics of race in America.

76 **The RAND Health Insurance Experiment** | This remains the largest health policy study in U.S. history and the only experimental study of how cost-sharing arrangements affect people's use of health services, the quality of care they receive, and their health status.

1970s

72 **Pioneering Studies on International Terrorism** | After the massacres at the Munich Olympics and Lydda Airport, RAND led the creation of a network of scholars and government officials responsible for dealing with terrorism. RAND developed the RAND Terrorism Chronology, a database that became an increasingly valuable tool for discerning trends in terrorist tactics and targeting.



74 **Computer Security and Privacy** | Willis Ware chaired a government committee that studied problems arising from the application of computer technology to record-keeping about people. This work eventually became the foundation of the federal Privacy Act of 1974.

78 **The World's Largest Permeable Dam** | A five-year joint effort between RAND and the Dutch government led to the creation of a storm-surge barrier with large movable gates, which balanced the environmental, economic, and safety concerns of the Netherlands.

79 **Criminal Justice Research** | RAND researchers confirmed that a small proportion of offenders commit a large percentage of crime, making career criminals a national priority, fostering new legislation, and focusing resources.

TOP: GWEN BELL/COMPUTERHISTORY.ORG; RIGHT: RAND CORPORATION/RAND ARCHIVE

84 **Strategic Defense and Deterrence** | RAND provided the first comprehensive assessment of how a technically successful defense against ballistic missiles would affect deterrence and strategic ability, the security interests of our allies, and arms control.

85 **Costs of Asbestos Litigation** | RAND published findings from the first study to examine the costs and compensation paid for asbestos personal injury claims: Claimants received only 37 cents of every dollar spent on litigation, with the rest going to defense and plaintiff attorneys' fees and other expenses.

87 **Chlorofluorocarbons** | RAND performed the economic analysis that, when coupled with a National Oceanic and Atmospheric Administration chemical model of the atmosphere, provided the policy-analytic basis for the global ban on the production of chlorofluorocarbons, halons, and other substances that deplete stratospheric ozone.

1980s

88 **Preventing Teenage Smoking and Drug Use** | Project ALERT—the most widely used science-based drug prevention program in the country, reaching more than 1.5 million middle school children a year—was developed at RAND.

89 **Monitoring the Results of Medical Care** | The Medical Outcomes Study (MOS) was the first large-scale attempt to measure medical outcomes in terms of how patients feel, function, and perform in their natural environment. RAND developed a number of brief screening instruments, including the RAND 36-Item Health Survey.

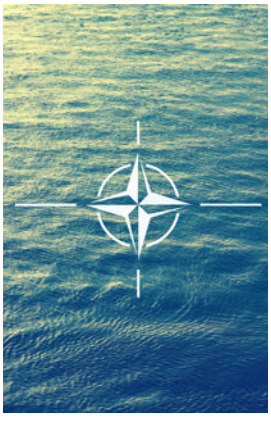
90 **Conventional Forces in Europe (CFE) Treaty** | RAND explored the consequences associated with new international arms control proposals and the potential effects of asymmetrical reductions in forces, providing the analytic basis for a treaty that helped stabilize Europe in the early days of the post–Cold War era.

92 **RAND Europe Established** | Ten RAND researchers moved into offices at the Delft University of Technology. Then known as the European–American Centre for Policy Analysis (EAC), its aim was to create a permanent and distinctively European presence, and one of its first acts was to hire local researchers. Today, the organization has a staff of 100, with offices in Cambridge, UK, and Brussels, BE.

94 **Controlling Cocaine** | The RAND study on controlling cocaine provided a powerful argument for increasing U.S. drug treatment programs. It is often cited in the debate on the effectiveness of the drug war.

1990s

96 **Intervention Strategies for At-Risk Youth** | Researchers identified three types of intervention more cost-effective in reducing crime than California's three-strikes law.



98 **NATO Expansion** | RAND experts on Europe and the Soviet Union recommended expanding NATO to include Poland, the Czech Republic, Slovakia, and Hungary. RAND's ideas and analyses helped inform the U.S. State Department's decision to pursue NATO expansion.

99 **HIV Cost and Services Utilization Study** | HCSUS was the first comprehensive U.S. survey of health care use among a nationally representative sample of persons in care for HIV. The study provided information on the costs of HIV care; barriers to access; and effects of HIV on quality of life, productivity, and family life.

ADOBE STOCK

00 Innovations in Logistics | RAND helped modernize U.S. military logistics by conducting analyses in support of the Air Force's Lean Logistics, the Army's Velocity Management, and the Marine Corps' Precision Logistics initiatives, among others. By adapting commercial management innovations to the military, these studies saved the DoD millions of dollars while improving warfighting effectiveness.

05 Computerizing Medical Records | RAND conducted the first comprehensive study to quantify the costs and potential health and cost benefits of health information technology.

10 Removing Barriers to U.S. Military Service | At the request of the Secretary of Defense, RAND updated a groundbreaking 1993 study on gay men and lesbians in the military, which found that a policy that ends discrimination based on sexual orientation could be implemented in a practical and realistic manner. The new analysis informed many of the recommendations of the DoD working group charged with considering the effects of the repeal of Don't Ask, Don't Tell.

11 Preventing Suicide in the U.S. Military | Researchers reviewed a wide range of suicide-prevention programs, revealing differences in how the Army, Marine Corps, Navy, and Air Force each approach the issue. Their analysis led to calls to reform prevention programs across the military and to adopt a standard approach that reflects a set of best practices identified by RAND.

15 Reducing Recidivism | RAND demonstrated that prison education programs increase the odds of an inmate getting a job by 13 percent, reduce the odds of an inmate returning to prison by 30–50 percent, and more than pay for themselves through avoided reincarceration costs.

17 Implications of the UK Vote to Leave the European Union | RAND explored the economic implications of eight different trade scenarios involving the UK, EU, and U.S. after Brexit, and used game theory insights to highlight the variety of factors that might affect the outcome of Brexit negotiations.

2000s

01 Education Vouchers and Charter Schools | RAND conducted a comprehensive analysis of the effects of vouchers and charter schools on academic achievement, school choice, access, integration, and civic socialization.

03 The *RAND History of Nation-Building* Series | As Operation Iraqi Freedom transitioned into the U.S. occupation of Iraq, RAND began a new line of inquiry on lessons learned from previous nation-building experiences.

04 Workers' Compensation | RAND's body of work on workers' compensation provided a new understanding of the relationship between benefits and wage loss and led to significant changes in the California workers' compensation system.

08 Invisible Wounds of War | RAND conducted the first large-scale, nongovernmental assessment of the psychological and cognitive needs of military service members who served in Iraq and Afghanistan. The project galvanized attention to the huge numbers of veterans suffering from PTSD, major depression, and traumatic brain injury; to barriers to receiving treatment; and to the billions of dollars in related societal costs.

09 Kids, Violence, and Trauma | Interventions designed by RAND to be administered by school mental health clinicians or by regular school staff with no mental health training have proven effective in reducing symptoms of PTSD and depression in students exposed to violence.

2010s

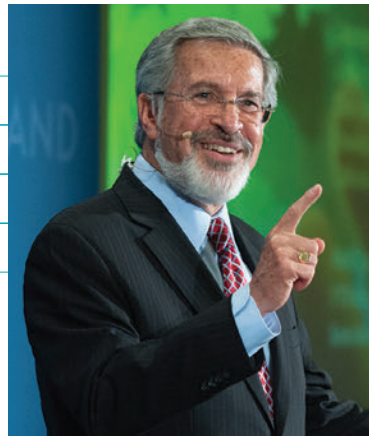
12 Reducing Flood Risk in Coastal Communities | RAND was instrumental in the development of Louisiana's 50-year coastal risk mitigation and restoration plan, adopted unanimously in 2012 by the Louisiana state legislature.

14 The Needs of Military Caregivers | In the largest such study to date, RAND researchers fielded a survey of military caregivers—informal caregivers (family and friends) who provide indispensable services and save the nation millions of dollars in health and long-term care costs.

18 Truth Decay | RAND launched a research effort to explore the diminishing role of facts and analysis in American public life, and will explore three related trends: the changing mix of opinion and objective reporting in journalism; the decline in public trust in major institutions; and a decline in media literacy.

TOP: ADOBE STOCK

Leonard D. Schaeffer makes a generous $3 million gift to endow the RAND Medal Awards.



The RAND Corporation has received a $3 million gift from Leonard D. Schaeffer—a trustee at RAND and member of the RAND Health Board of Advisors—to help endow the RAND Medal Awards, which recognizes employees who have made significant and inspiring contributions to RAND's mission and priorities. The top award, previously known as the President's Choice award, has been renamed the Leonard Schaeffer Medals in recognition of the gift. The Leonard Schaeffer Medals will be granted annually to two individuals or teams.

> **"The quality of an organization's staff is what sets it apart from its peers. At RAND, I've seen how skilled and dedicated RAND's employees are at developing solutions to the most-significant challenges of our time."**
>
> LEONARD SCHAEFFER

"The quality of an organization's staff is what sets it apart from its peers. At RAND, I've seen how skilled and dedicated RAND's employees are at developing solutions to the most-significant challenges of our time," said Schaeffer. "I'm pleased to help support a high bar of excellence among this high-achieving community."

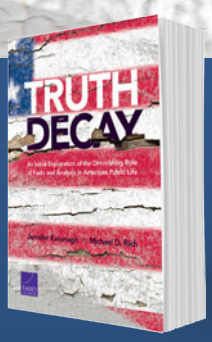
Remarking on Schaeffer's long-standing relationship with RAND and the impact of this gift, Michael D. Rich, RAND's president and CEO, said, "Leonard Schaeffer is a valued RAND adviser, and his contributions to society as a public servant, business leader, and philanthropist embody the vision, integrity, and leadership that RAND's Medal Awards are designed to honor and inspire. We are grateful for his generosity and honored to use this gift to recognize excellence at RAND."

A longtime supporter and champion of RAND research, Schaeffer has made previous gifts in support of the Leonard Schaeffer RAND–USC Initiative in Health Policy and Economics and the COMPARE microsimulation model built by RAND researchers that predicts the effects of health policy changes at national and state levels.

Schaeffer is the founding chairman and CEO of WellPoint (now Anthem) and has held posts in both state and federal government. In addition to his roles as trustee and board member at RAND, Schaeffer is the Judge Robert Maclay Widney Chair and a professor at the University of Southern California. He established the Leonard D. Schaeffer Center for Health Policy and Economics at USC and serves as the chair of that center's advisory board. Schaeffer has endowed academic chairs in health policy and economics at the Brookings Institution, the National Academy of Medicine, Harvard Medical School, and USC. He is a member of the National Academy of Medicine and a graduate of Princeton University.

TRUTH DECAY

An Initial Exploration of the Diminishing Role of Facts and Analysis in American Public Life



A new book by political scientist Jennifer Kavanagh and RAND's president and CEO, Michael D. Rich

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