From: https://www.nationalacademies.org/ocga/briefings-tocongress/the-national-imperative-to-improve-nursing-homequality-honoring-our-commitment-to-residents-families-and-staff

RECOMMENDATIONS

APRIL 2022 • THE NATIONAL IMPERATIVE TO IMPROVE NURSING HOME QUALITY: HONORING OUR COMMITMENT TO RESIDENTS, FAMILIES, AND STAFF

The impact of COVID-19 on nursing home residents and staff has renewed attention to the long-standing weaknesses that impede the provision of high-quality nursing home care. With support from a coalition of sponsors, the National Academies convened a committee to examine how the United States delivers, finances, regulates, and measures the quality of nursing home care. The committee identified seven broad goals and an interrelated set of recommendations to provide an overarching framework for improving the quality of care in nursing homes. Please see Appendix D in the report for a table of the committee's recommendations organized by responsible partners.

GOAL 1: Deliver comprehensive, person-centered, equitable care that ensures residents' health, quality of life, and safety; promotes autonomy; and manages risks

Recommendation 1A: As a critical foundation to operationalizing person-centered care that reflects resident goals and preferences, the committee recommends compliance with regulations for person-centered care. Nursing homes,¹ with oversight by the Centers for Medicare & Medicaid Services, should:

- Identify the care preferences of residents and their chosen families using structured, shared decision-making approaches that balance resident preferences for safety and autonomy.
- Ensure that resident care preferences are accurately documented in the care plan.
- Interdisciplinary care team members should make certain that every resident's care plan addresses psychosocial and behavioral health as well as nursing and medical needs.
- To certify that all aspects of the resident's care needs are fully addressed in the care plan, the interdisciplinary care team should review and evaluate the care plan to ensure it is complete, with oversight of the review and evaluation process provided by nursing staff at least at the level of registered nurse.
- A complete plan should include evaluation steps (i.e., specific measures and timing of measurement) to assess the degree of implementation and success of each element.
- Implement and monitor each element of every resident's care plan and evidence of effective implementation to ensure that the care delivered continues to align with the resident's preferences.
 - Nursing homes staff should revisit the care plan on a regular basis for all residents—at a minimum on a quarterly basis, when requested by the family/resident, or when there has been a significant change in condition as specified in the Long-Term Care Facility Resident Assessment Instrument 3.0 Users' Manual.

Recommendation 1B: The federal government (e.g., the Agency for Healthcare Research and Quality, the Centers for Medicare & Medicaid Services, the Center for Medicare & Medicaid Innovation, the Centers for Disease Control and Prevention, and the National Institutes of Health), private foundations, academic institutions, and long-term care provider organizations should prioritize and fund rigorous, translational research and demonstration projects to identify the most effective care delivery models to provide high-quality comprehensive, person-centered care for short-stay and long-stay nursing home residents.

- This research should focus on identifying care delivery models that reduce care disparities and strengthen connections among the nursing homes, the communities in which they are located, and the broader health care and social services sectors.
- Research on care delivery models should evaluate innovations in all aspects of care, including optimal staffing, physical environment, financing and payment, the use of technology, leadership models, and organizational policy.

¹ While the committee calls on nursing homes to implement many of its recommendations, it recognizes that it is the individual nursing home owners, administrators, and clinical leaders who need to be held accountable for the quality of care provided within their specific organizations. The active role of these individuals is necessary to ensure the committee's recommendations are put into place.

Recommendation 1C: In order to safeguard nursing home residents and staff against a broad range of potential emergencies, the U.S. Department of Homeland Security should direct the Federal Emergency Management Agency to reinforce and clarify the Emergency Support Functions (ESF) of the National Response Framework. Specifically,

- ESF#8 (Public Health and Medical Services) should be revised to give greater prominence to nursing homes with the goal of clarifying that nursing homes specifically, and long-term care facilities more broadly, are included within ESF#8 (Public Health and Medical Services) to ensure that state and local emergency management documents and plans contain specific guidance for nursing homes during an emergency.
- ESF#15 (External Affairs Annex) should be revised to specifically include residents of nursing homes as part of the target group of "individuals with disabilities and others with access and functional needs."

Recommendation 1D: To ensure the physical safety as well as address behavioral health and psychosocial needs of nursing home residents and staff in public health emergencies and natural disasters:

- State regulatory agencies (with federal oversight from the Federal Emergency Management Agency and the Centers for Medicare & Medicaid Services [CMS]) should ensure the development and ongoing maintenance of formal relationships, including strong interface, coordination, and reliable lines of communication, between nursing homes and local, county, and state-level public health and emergency management departments.
- State emergency management agencies should make certain that nursing homes are represented in
 - state, county, and local emergency planning sessions and drills;
 - local government community disaster response plans; and
 - every phase of the local emergency management planning including mitigation, preparedness, response, and recovery.
- State emergency management agencies should ensure that every nursing home has ready access to personal protective equipment (PPE).
- CMS (through state regulatory agencies) is to ensure that *existing* regulations are enforced, including:
 - Nursing home leadership ensures that there is a written emergency plan (including evacuation plans) for common public health emergencies and natural disasters in the facility's location, which is created in partnership with local emergency management and resident and family councils.
 - Nursing home leadership reviews and updates the plan at least once every year.
 - Nursing home staff are to be routinely trained in emergency response procedures and periodically review procedures.
 - Nursing home staff are to be routinely trained in the appropriate use of PPE and infection control practices.
 - Nursing home leadership ensures that there is an emergency preparedness communication plan that includes formal procedures for contacting residents' families and staff to provide information about the general condition and location of residents in the case of an emergency or disaster.
 - Documentation concerning emergency plans as well as of the conduct of emergency drills and staff awareness of emergency management plans should be added to Care Compare.

Recommendation 1E: Nursing home owners, with the support of federal and state governmental agencies, should construct and reconfigure (renovate) nursing homes to provide smaller, more home-like environments and/or smaller units within larger nursing homes that promote infection control and person-centered care and activities.

- The design of these nursing homes should include consideration for the following characteristics: unit size, activity and dining space by unit, a readily accessible therapeutic outdoor area, an open kitchen, a staff work area, and entrances and exits.
 - Smaller units should be designed to have the flexibility to address a range of resident care and rehabilitation needs.
 - New designs should prioritize private bedrooms and bathrooms.
 - This shift to more home-like settings should be implemented as part of a broader effort to integrate the principles of culture change, such as staff empowerment, consistent staff assignment, and person-centered care practices, into the management and care provided within these settings.

- The Centers for Medicare & Medicaid Services, the U.S. Department of Housing and Urban Development, and other governmental agencies should develop incentives to support designs for nursing home environments (both new construction and renovations).
- State licensure decisions should ensure that all new nursing homes are constructed with single-occupancy bedrooms and private bathrooms for most or all residents.

GOAL 2: Ensure a well-prepared, empowered, and appropriately compensated workforce

Recommendation 2A: Federal and state governments, together with nursing homes, should ensure competitive wages and benefits (including health insurance, child care, and sick pay) to recruit and retain all types of full- and part-time nursing home staff. Mechanisms that should be considered include wage floors, requirements for having a minimum percentage of service rates directed to labor costs for the provision of clinical care, wage pass-through requirements, and student loan forgiveness.

Recommendation 2B: The Centers for Medicare & Medicaid Services should enhance the current minimum staffing requirements for every nursing home to include:

- On-site direct-care registered nurse (RN) coverage (in addition to the director of nursing) at a minimum of a 24-hour, 7-days-per-week basis with additional RN coverage that reflects resident census, acuity, case mix, and the professional nursing needs for residents as determined by the residents' assessments and care plans.
- Full-time social worker with a minimum of a bachelor's degree in social work from a program accredited by the Council on Social Work Education and 1 year of supervised social work experience in a health care setting (including field placements and internships) working directly with individuals to address behavioral and psychosocial care.
- An infection prevention and control specialist who is an RN, advanced practice RN, or a physician at a level of dedicated time sufficient to meet the needs of the size and case mix of the nursing home.

Recommendation 2C: The U.S. Department of Health and Human Services (e.g., the Centers for Medicare & Medicaid Services [CMS], the Agency for Healthcare Research and Quality, and the National Institutes of Health) should fund research to identify and rigorously test specific minimum and optimum staffing standards for direct-care staff (e.g., advanced practice registered nurses, registered nurses, licensed practical nurses/licensed vocational nurses, certified nursing assistants, therapists, recreational staff, social workers, and other direct-care providers), including weekend and holiday staffing, based on resident case mix and the type of staff needed to address the care needs of specific populations. Based on the results of this research, CMS and state governments should update the regulatory requirements for staffing standards in nursing homes to reflect new minimum requirements and account for case mix.

Recommendation 2D: To enhance the available expertise within a nursing home:

- Nursing home administrators, in consultation with their clinical staff, should establish consulting or employment relationships with qualified licensed clinical social workers at the M.S.W. or Ph.D. level, advanced practice registered nurses (APRNs), clinical psychologists, psychiatrists, pharmacists, and others for clinical consultation, staff training, and the improvement of care systems, as needed.
- The Centers for Medicare & Medicaid Services should create incentives for nursing homes to hire qualified licensed clinical social workers at the M.S.W. or Ph.D. level as well as APRNs for clinical care, including allowing Medicare billing and reimbursement for these services.

Recommendation 2E: To advance the role of and empower the certified nursing assistant (CNA):

- Nursing homes should provide career advancement opportunities and peer mentoring;
- Federal and state governments, together with nursing homes should enable free entry-level training and continuing education (e.g., in community colleges);
- Nursing homes should cover CNAs' time for completing education and training programs; and
- The Health Resources and Services Administration should fund training grants to advance and expand the role of the CNA and develop new models of care delivery that take advantage of the role of the CNA as a member of the interdisciplinary care team.

Recommendation 2F: The Centers for Medicare & Medicaid Services (CMS) should establish minimum education and national competency requirements for nursing home staff, to include:

- Nursing home administrator: minimum of a bachelor's degree and training in topics relevant to their role (e.g., culture change, leadership and team-building, administration, and financial management);
- Medical director: completion of education or certification program specific to the care of older adults and certification in infection control and prevention;
- Director of nursing: minimum of a bachelor's degree in nursing, with a preference for master's level training; training in geriatrics and long-term care; and certification in infection control and prevention;
- Director of social services: minimum of a bachelor's degree in social work from a program accredited by the Council on Social Work Education (CSWE), with a preference for master's level training from a program accredited by CSWE; and
- Certified nursing assistants: an increase in the federal minimum of training hours to become a certified nursing assistant from 75 hours to 120 hours and training content that includes competency-based training requirements

CMS and nursing homes should give special consideration for current staff members who do not meet these enhanced requirements and provide flexible, low-cost, and high-quality pathways to achieve these baseline education and competency levels.

Furthermore, to prepare future workers for their roles, all education programs preparing health care professionals should include content related to gerontology, geriatric assessment, long-term care, and palliative care, with an additional preference for clinical experience in a nursing home.

Recommendation 2G: To enhance the education and training of the entire nursing home workforce:

- The Centers for Medicare & Medicaid Services should require all levels of nursing home staff to complete annual continuing education training to ensure that staff members are meeting national competency standards.
- Nursing homes should provide ongoing diversity and inclusion training (e.g., self-awareness of and approaches to addressing racism) for all workers and leadership and ensure that the training is designed to meet the unique demographic, cultural, linguistic, and transportation needs of the community in which the nursing home is situated and the community of workers within the nursing home.
- Nursing homes should provide family caregivers with resources, training, and opportunities to participate as part of the caregiving team in the manner and to the extent that residents desire their chosen family members to be involved.

Recommendation 2H: As a part of routine (e.g., at least annual) data collection, nursing homes should collect and report data to the Centers for Medicare & Medicaid Services regarding:

- Baseline demographic information on medical directors, administrators, and directors of nursing, including name, licensure, contact information, and tenure in their position;
- The geriatrics or long-term care training, expertise, and staffing patterns (including time providing direct care) of medical directors, advanced practice registered nurses, social workers, physicians, and physician assistants providing services in nursing homes; and
- The numbers and staffing patterns (including time providing direct care) for all contract and agency staff providing services in nursing homes.

Recommendation 21: The U.S. Department of Health and Human Services (e.g., the Centers for Medicare & Medicaid Services, the Agency for Healthcare Research and Quality, and the National Institutes of Health) should fund research on systemic barriers and opportunities to improve the recruitment, training, and advancement of all nursing home workers, with a particular focus on certified nursing assistants. This research should include the collection of gender-, ethnicity-, and race-related outcomes of job quality indicators (e.g., hiring, turnover, job satisfaction).

GOAL 3: Increase transparency and accountability of finances, operations, and ownership

Recommendation 3A: The U.S. Department of Health and Human Services (HHS) should collect, audit, and make publicly available detailed facility-level data on the finances, operations, and ownership of all nursing homes (e.g., through Medicare and Medicaid cost reports and data from Medicare's Provider Enrollment, Chain, and Ownership System).

• HHS should ensure that the data allow the assessment of staffing patterns, deficiencies, financial arrangements and payments, related party entities, corporate structures, and objective quality indicators by common owner (i.e., chain and multi-facility owners) and management company.

Recommendation 3B: The U.S. Department of Health and Human Services should ensure that accurate and comprehensive data on the finances, operations, and ownership of all nursing homes are available in a real-time, readily usable, and searchable database so that consumers, payers, researchers, and federal and state regulators are able to use the data to:

- Evaluate and track the quality of care for facilities with common ownership or management company.
- Assess the impact of nursing home real estate ownership models and related-party transactions on the quality of care.

GOAL 4: Create a more rational and robust financing system

Recommendation 4A:² To move toward the establishment of a federal long-term care benefit that would expand access and advance equity for all adults who need long-term care, including nursing home care:

- The Secretary of the U.S. Department of Health and Human Services should study ways in which this federal benefit would be designed to avoid challenges faced by previous efforts to expand long-term care coverage.
- The Centers for Medicare & Medicaid Services should implement state demonstration programs to test this federal benefit model prior to national implementation.

Recommendation 4B: To ensure that adequate funds are invested in providing comprehensive care for longstay nursing home residents:

• The Centers for Medicare & Medicaid Services should ensure compliance with existing statute by using detailed and accurate nursing home financial information to ensure that Medicaid (or eventually, federal) payments are at a level that is adequate to cover the delivery of comprehensive, high-quality, and equitable care by all providers to nursing home residents across all domains of care (as specified in Chapter 10, Box 10-1).

Recommendation 4C: The U.S. Department of Health and Human Services should require a specific percentage of nursing home Medicare and Medicaid payments to be designated to pay for direct-care services for nursing home residents, including staffing (including both the number of staff and their wages and benefits), behavioral health, and clinical care.

Recommendation 4D: To improve the value of, and accountability for, Medicare payments for short-stay post-acute care in nursing homes, the U.S. Department of Health and Human Services, the Centers for Medicare & Medicaid Services, and the Center for Medicare & Medicaid Innovation should extend bundled payment initiatives to all conditions, and in so doing, hold hospitals financially accountable (i.e., put hospitals "at-risk") for Medicare post-acute care spending and outcomes.

Recommendation 4E: To eliminate the current financial misalignment for long-stay residents introduced by Medicaid's coverage of their nursing home services and Medicare's coverage of health care services, the U.S. Department of Health and Human Services and the Centers for Medicare & Medicaid Services should conduct demonstration projects to explore the use of alternative payment models (APMs) for long-term nursing home care, separate from bundled payment initiatives for post-acute care. These APMs would use global capitated budgets, making care provider organizations or health plans accountable for the total costs of care.

² One committee member declined to endorse this recommendation.

- APM's capitated rate should include post-acute care and hospice care for long-term nursing home residents to address financial misalignment between Medicare and Medicaid payments, while supporting care coordination.
- Designs and payments of the demonstration projects should be tied to broad-based quality metrics, including staffing metrics, residents' experience of care, functional status, and end-of-life care to ensure that APMs maintain quality of care, particularly in areas such as post-acute care, end-of-life care, and hospice care.

GOAL 5: Design a more effective and responsive system of quality assurance

Recommendation 5A: The Centers for Medicare & Medicaid Services (CMS) should ensure that state survey agencies have adequate capacity, organizational structure, and resources to fulfill their current nursing home oversight responsibilities for monitoring, investigation, and enforcement.

- In particular, CMS should ensure that state survey agencies have adequate capacity and resources to deliver a strong, consistent, responsive, and transparent process for complaints.
- Along with providing the necessary resources, CMS should refine and expand oversight performance metrics of survey agencies for annual public reporting which would facilitate greater accountability related to whether existing federal regulations are being consistently and completely enforced and would highlight shortcomings that need to be addressed.
- CMS should use existing strategies of enforcement where states have consistently fallen short of expected standards.

Recommendation 5B: The Centers for Medicare & Medicaid Services (CMS) should develop and evaluate strategies (including the evaluation of potential unintended consequences) that make nursing home quality assurance efforts more effective, efficient, and responsive, including potential longer-term reforms such as:

- Enhanced data monitoring (using prior survey performance in combination with real-time quality metrics) to track performance and triage on-site inspections of facilities;
- Increased oversight across a broader segment of poorly performing facilities (e.g., through substantially improving the Special Focus Facilities program);
- Modified formal oversight activities for high-performing facilities, including the consideration of more targeted inspections, provided adequate safeguards are in place, including:
 - surveyors are present onsite at least annually;
 - states meet expected standards for responding to complaints; and
 - nursing homes continue to meet specified, real-time quality metrics (e.g., a robust threshold of staffing hours per resident day, stable ownership); and
- Greater use of enforcement remedies beyond civil monetary penalties, including chain-wide corporate integrity agreements, denial of admissions, directed plans of correction, temporary management, and termination from Medicare and Medicaid.

Recommendation 5C: The Administration for Community Living should advocate for increased funding for the Long-Term Care Ombudsman Program. Additional resources should be allocated toward:

- Hiring additional paid staff and training staff and volunteers,
- Bolstering programmatic infrastructure (e.g., electronic data monitoring systems to track staff and volunteer activities and track resident and family complaints),
- Making data on state long-term care ombudsman programs and activities publicly available, and
- Developing summary metrics designed to document the effectiveness of the Long-Term Care Ombudsman Program in advocating for nursing home residents.

Additionally, states should contribute funds to their long-term care ombudsman programs to address crossstate variation in the extent to which these programs have the capacity to advocate for nursing home residents. Along with additional resources, all state units on aging should develop plans for their long-term care ombudsman programs to interface effectively with collaborating entities such as adult protective services, state survey agencies, and state and local law enforcement agencies. **Recommendation 5D:** When data on the finances and ownership of nursing homes reveal a pattern of poor quality care across facilities with a common owner (including across states), federal and state oversight agencies (e.g., the Centers for Medicare & Medicaid Services, state licensure and survey agencies, the U.S. Department of Justice) should impose oversight and enforcement actions on the owner. These actions may include:

- Denial of new or renewed licensure,
- The imposition of sanctions, including the exclusion of individuals and entities from participation in Medicare and Medicaid, and
- The implementation of strengthened oversight (e.g., through an improved and expanded special focus facilities program).

Recommendation 5E: States should eliminate certificate-of-need requirements and construction moratoria for nursing homes to encourage the entry of innovative care models and foster robust competition in order to expand consumer choice and improve quality.

GOAL 6: Expand and enhance quality measurement and continuous quality improvement

Recommendation 6A: The Centers for Medicare & Medicaid Services (CMS) should add the Consumer Assessment of Healthcare Providers and Systems (CAHPS) measures of resident and family experience (i.e., the nursing home CAHPS surveys) to Care Compare.

- Data for this measure should be collected annually by independent reviewers (i.e., not nursing home staff) in all nursing homes.
- As data are collected nationally, ongoing psychometric testing should occur to refine the measures in order to support submission for endorsement by the National Quality Forum.

Recommendation 6B: The U.S. Department of Health and Human Services, the Centers for Medicare & Medicaid Services, the National Institutes of Health, and the Agency for Healthcare Research and Quality should expand and enhance existing publicly reported quality measures in Care Compare by:

- Increasing the weight of staffing measures within the five-star composite rating;
- Facilitating the ability to see quality performance of facilities that share common ownership (i.e., chain and other multi-facility owners) or management company;
- Improving the validity of Minimum Data Set-based measures of clinical quality (e.g., better risk adjustment, auditing for accuracy, inclusion of resident preferences); and
- Conducting additional testing to improve the differentiation of the five-star composite rating so that it better distinguishes among the middle ranges of rating, not just at the extremes.

Recommendation 6C: The U.S. Department of Health and Human Services should fund the development and adoption of new nursing home measures to Care Compare related to:

- Palliative care and end-of-life care;
- Implementation of the resident's care plan;
- Receipt of care that aligns with resident's goals and the attainment of those goals;
- Staff well-being and satisfaction;
- Psychosocial and behavioral health; and
- Structural measures (e.g., health information technology adoption and interoperability; percentage of single occupancy rooms; emergency preparedness; routine training in infection prevention; emergency response management; financial performance; staff employment arrangements [e.g., full-time, part-time, contract and agency staff])

Recommendation 6D: The U.S. Department of Health and Human Services (HHS) should develop an overall health equity strategy for nursing homes that includes defining, measuring, evaluating, and intervening on disparities in nursing home care. The strategy should include:

• Definitions of health equity and disparities in nursing homes, including disparities related to race, ethnicity, LGBTQ+ populations, and sources of payment; and

• The development of new measures of disparities in nursing home care, both within and across facilities, at the national, state, and ownership levels, to be included in a national report card.

As a first step, a minimum data set of information to identify and describe disparities should be established, with data collected at least annually and made publicly available. The information should include characteristics of the communities in which nursing homes are embedded as well as the ability of community members to access nursing home care.

- Research regarding disparities and the development of policies and culturally tailored interventions should be a priority for funding by HHS, the National Institutes of Health, and other sources.
- HHS, in partnership with state and local governments, should use data to identify the types and degree of disparity to prioritize when action is needed and to identify the promising pathways to reduce or eliminate those disparities.

Recommendation 6E: The Centers for Medicare & Medicaid Services (CMS) should allocate funds to state governments for grants to develop and operate state-based, nonprofit, confidential technical assistance programs that have an ongoing and consistent focus on nursing homes. These programs should provide up-to-date, evidence-based education and guidance in best clinical and operational practices to help nursing homes implement effective continuous quality-improvement activities to improve care and nursing home operations.

- CMS should create explicit standards for these programs to promote comparable programs across states.
- The program should conduct ongoing analysis and reporting of effectiveness of the services provided.
- The program should provide services to all nursing homes in the state, with a focus on those identified as being at risk for poor performance, but also available to those with moderate and high performance.
- The program should coordinate with state surveyors and ombudsmen and receive referrals regarding facilities needing assistance, but maintain the confidentiality of the details of the services provided to each facility (notwithstanding the mandated reporting requirements in each state regarding resident abuse and neglect).
- The programs should consider partnering with relevant academic institutions of higher education, such as colleges of nursing, medicine, social work, rehabilitation services, and others.

GOAL 7: Adopt health information technology in all nursing homes

Recommendation 7A: The Office of the National Coordinator (ONC) and the Centers for Medicare & Medicaid Services should identify a pathway to provide financial incentives to nursing homes for certified electronic health record (EHR) adoption that supports health information exchanges to enhance person-centered longitudinal care. These incentives should be modeled on the Health Information Technology for Economic and Clinical Health incentives provided to eligible hospitals and professionals.

- ONC should ensure that the nursing home program complements the Promoting Interoperability Program; and
- ONC should develop appropriate nursing home EHR certification criteria that promote adoption of health information exchange of important clinical data (e.g., admission, discharge, and transfer data).

Recommendation 7B: In order to measure and report on health information technology (HIT) adoption and interoperability in nursing homes, the U.S. Department of Health and Human Services should:

- Develop measures for HIT adoption and interoperability, consistent with other health care organizations;
- Measure levels of HIT adoption and interoperability on an annual basis and report results in Care Compare; and
- Measure and report nursing home staff, resident, and family perceptions of HIT usability.

Recommendation 7C: The Centers for Medicare & Medicaid Services and the Health Resources and Services Administration should provide financial support for the development and ongoing implementation of workforce training, emphasizing core health information technology competencies for nursing home leadership and staff, such as clinical decision support, telehealth, integration of clinical processes, interoperability, and knowledge management in patient care.

Recommendation 7D: The Office of the National Coordinator and the Agency for Healthcare Research and Quality should fund rigorous evaluation studies to explore:

- the use of health information technology (HIT) to improve nursing home resident outcomes;
- disparities in HIT adoption and use across nursing homes;
- innovative HIT applications for resident care; and
- the assessment of clinician, resident, and family perceptions of HIT usability.

To read the full report, please visit: http://www.nationalacademies.org/nursing-homes

> *The National Academies of* SCIENCES • ENGINEERING • MEDICINE

> The nation turns to the National Academies of Sciences, Engineering, and Medicine for independent, objective advice on issues that affect people's lives worldwide. www.nationalacademies.org

Copyright 2022 by the National Academy of Sciences. All rights reserved.