

Executive Summary: Health Impact Review of SSB 6554

Providing Life Alert Services

Evidence and expert opinion at both the local and state level indicate that SSB 6554 has potential to improve health outcomes for some individuals who are disproportionately impacted by death, illness, and injury during disasters, thereby helping to decrease health disparities.

BILL INFORMATION

Sponsors: Senate Energy, Environment & Telecommunications (originally sponsored by Senator Ranker)

Summary of Bill:

- Employees of companies providing life alert services—also known as personal emergency response systems (PERS)—must provide the location and known medical conditions of their customers when requested by first responders during an emergency.
- First responders must keep this information confidential, use it only for responding to the emergency that prompted the information request, destroy it at the end of the emergency, and give written notification of such destruction to the PERS company.
- “Life alert services” are defined as services provided for profit that allows the customer in need of emergency assistance to contact a call center through the activation of a wearable device such as a pendant or bracelet.
- “Emergency” is defined as an “unforeseen combination of circumstances that require the attention of first responders acting within their official duties. An emergency includes the outage of life alert services for more than twenty-four continuous hours.”

HEALTH IMPACT REVIEW

Summary of Findings:

This health impact review found the following evidence regarding the provisions in SSB 6554:

- The majority of experts interviewed indicated that SSB 6554 would likely result in first responders requesting PERS customer information to inform emergency responses (check on customers, coordinate special transportation, etc.).
- The majority of experts interviewed indicated that using PERS customer records to inform emergency responses would likely have positive health impacts on PERS customers during and after emergencies.
- The majority of experts interviewed indicated that PERS customers are primarily “at-risk” or “vulnerable” populations such as older adults, individuals with disabilities or chronic conditions, individuals with limited mobility, and those living alone.*
- There is strong evidence in the scientific literature that at-risk or vulnerable populations such as older adults, individuals with disabilities or chronic conditions, individuals with limited mobility, and those living alone are more likely than their counterparts to experience negative health outcomes during an emergency—so improving health outcomes for these populations would likely decrease health disparities between these populations and their counterparts.
- This review did not find enough evidence to determine if SSB 6554 would have equitable impacts across demographics such as race/ethnicity, education, income, or primary language.
- This review did not find enough evidence to determine if SSB 6554 would have equitable impacts on rural and urban individuals.

* Note that this indicates the majority of PERS customers are likely vulnerable individuals, **not** that all vulnerable individuals have PERS services.

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Providing Life Alert Services

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Introduction and Methods

A health impact review is an analysis of how a proposed legislative or budgetary change will likely impact health and health disparities in Washington ([RCW 43.20.285](#)). For this review ‘health disparities’ have been defined as the differences in disease, death, and other adverse health conditions that exist between populations ([RCW 43.20.270](#)). This document provides summaries of the evidence analyzed by State Board of Health staff during the health impact review of Substitute Senate Bill 6554 ([SSB 6554](#)).

Staff analyzed the content of SSB 6554 and created a logic model depicting possible pathways leading from the provisions of the bill to health outcomes. We conducted objective reviews of the literature for each component of the pathway using databases including PubMed and Google Scholar. Life alert systems are referred to in the literature under many different titles, including: personal emergency response systems (PERS), medical emergency response systems, and medical alert services. These systems are also often referred to by a specific company name (e.g. Life Alert, Lifeline). We used these search terms among others when reviewing the literature. We use the term PERS throughout this review because this is a generic term that applies to all brands and is not being used as a company name.

We did not identify any research on the relationship between allowing first responders to access PERS customer information during an emergency and health outcomes. For this reason we contacted experts in the fields of emergency medical services (EMS), public health, and emergency management, as well as those with experience working with vulnerable or older adults. These key informants, provided information on how SSB 6554 would likely impact health and health equity. We took detailed notes during the conversations and gave key informants the opportunity to review a draft of the document to ensure that their comments had been accurately represented. We coded and analyzed these notes to identify themes and to determine the proportion of the key informants who held a particular opinion.

In total, we interviewed 16 key informants—12 experts representing 11 counties around the state and 4 who work at the state level. In completing this review, we also received consultation and technical assistance from 5 additional experts at the state level. Finally, we spoke with 7 representatives from PERS companies. Appendix A provides detailed information on our selection of experts.

The logic model is presented in text and through a flowchart (Figure 1) and presents the strength of the evidence for each relationship. We evaluate the strength-of-evidence using the following criteria:

- **Minimal evidence:** the literature review yielded only one study supporting the association, *or* the literature review yielded several studies supporting the association but also some studies which found no association or a negative relationship.
- **Some evidence:** the literature review yielded several studies supporting the association, but a large body of evidence was not established.
- **Strong evidence:** the literature review yielded a large body of evidence on the relationship (a majority of which supported the association) but the body of evidence contained some contradictory findings, did not incorporate the most robust study designs or data analysis, had significant but not meaningful results, or some combination of these.
- **Very strong evidence:** the literature review yielded a very large body of robust evidence supporting the association with few if any contradictory findings. The evidence indicates that the scientific community largely accepts the existence of the association.
- **Expert opinion:** A majority of the experts interviewed expressed that this relationship exists.

The annotated references are only a representation of the evidence and provide examples of current research. In many cases only a few review articles are referenced. One article may cite or provide analysis of dozens of other articles. Therefore the number of references included in the bibliography does not necessarily reflect the strength-of-evidence.

Analysis of SSB 6554 and the Scientific Evidence

Summary of SSB 6554

- Employees of companies providing life alert services—also known as personal emergency response services (PERS)—must provide the location and known medical conditions of their customers when requested by first responders during an emergency.
- First responders must keep this information confidential, use it only for responding to the emergency that prompted the information request, destroy it at the end of the emergency, and give written notification of such destruction to the PERS company.
- “Life alert services” are defined as services provided for profit that allows the customer in need of emergency assistance to contact a call center through the activation of a wearable device such as a pendant or bracelet.
- “Emergency” is defined as an “unforeseen combination of circumstances that require the attention of first responders acting within their official duties. An emergency includes the outage of life alert services for more than twenty-four continuous hours.”

Health impact of SSB 6554

Evidence and expert opinion at both the local and state level indicate that SSB 6554 has potential to improve health outcomes among individuals who are disproportionately impacted by death, illness, and injury during disasters, thereby helping to decrease health disparities.

Pathways to health impacts

Fourteen of 16 experts interviewed indicated that SSB 6554 would likely result in first responders using their authority to request PERS customer information to inform emergency responses (check on customers, coordinate special transportation, etc.). Fourteen of 16 key informants also indicated that using PERS customer records to inform emergency responses would likely have positive health impacts on PERS customers during and after emergencies. In addition 15 experts indicated that the majority of PERS customers are likely older adults, individuals with disabilities or chronic conditions, and other vulnerable individuals. There is strong evidence from the literature that these populations are disproportionately impacted by emergencies and are at increased risk for death, injury, and illness during disasters.¹⁻⁷ Therefore, SSB 6554 has potential to decrease the disproportionate negative impact of emergencies on these at-risk populations, thereby helping to decrease health disparities.

Logic Model

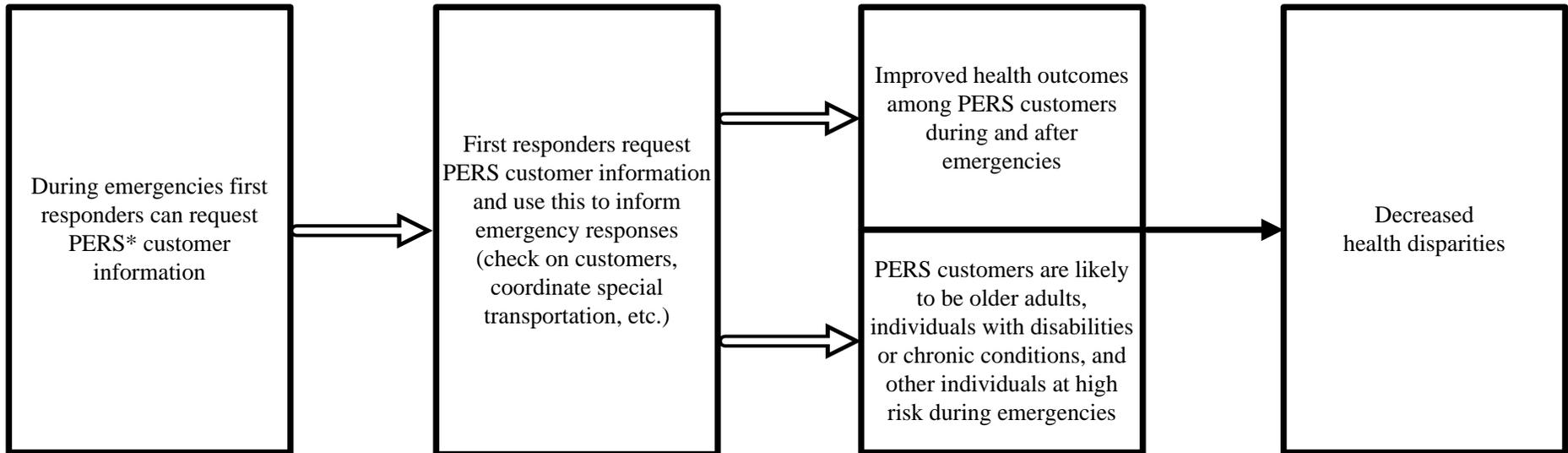
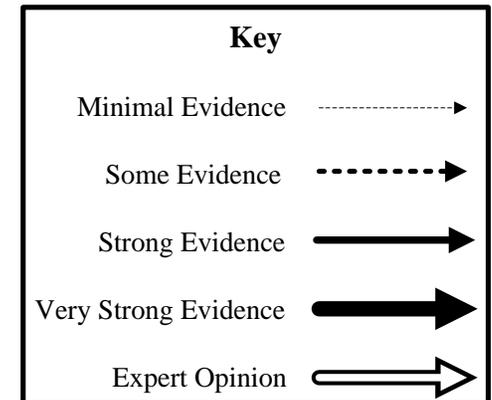


Figure 2
Providing Life Alert Services
SSB 6554



*PERS: Personal emergency response system (also known as medical emergency response system, medical alerts services, or under company names such as Life Alert, Lifeline, Lifewatch, etc.)

Summaries of Findings

Would SSB 6554 result in first responders using their authority to request PERS customer information to inform emergency responses (check on customers, coordinate special transportation, etc.)?

In order to determine if first responders in Washington state would leverage the provisions of SSB 6554 and request and utilize PERS customer information we interviewed experts across the state. Fourteen of the 16 key informants (~88%) indicated that this information would be useful in an emergency and that they would request and use the information if appropriate. Most key informants indicated that they would not expect to request this information frequently, as disasters or widespread emergencies are not a daily occurrence.

Key informants did, however, raise some concerns with SSB 6554 that could decrease the likelihood of first responders requesting PERS customer information. Eight experts indicated that the bill does not clarify if first responders would be responsible to act on the information once they had requested it and, therefore, inherit some level of liability for the safety of PERS customers. In addition we found some inconsistency between key informants in how they interpreted the bill. Interpretations that would make implementing the provisions of the bill seem too resource intensive could cause first responders to avoid requesting the information. A number of key informants indicated that in order for first responders to successfully employ the bill some language would need to be clarified. It falls outside the scope of this review to provide these specific comments here, but this additional feedback has been forwarded to the original bill sponsor.

If first responders request PERS customer information to inform emergency responses, would this improve health outcomes for PERS customers during and after emergencies?

We were unable to identify any published research specifically on the health impacts of first responders accessing and using PERS customer information during an emergency. We therefore depended on experts in the field to provide informed opinions on how implementing this bill would likely impact customers. Fourteen of the 16 key informants (~88%) indicated that this bill would likely have a positive health impact on PERS customers. The remaining 2 experts indicated that there are probably better ways to meet the intentions of the bill, such as through currently available systems or by implementing opt-in vulnerable individual registries. A number of key informants did indicate that it is best for first responders to have this type of information before an emergency or as early into an emergency as possible. They expressed that if PERS services go off-line, waiting 24 hours to access this information would likely be too long to delay before responding.

Chief Kevin O'Brien, Fire Chief and Chief Executive Officer of Orcas Island Fire and Rescue, indicated that Orcas Island experienced a telecommunication outage in 2013 that took off-island phone service offline. Because most PERS devices call for help through a long distance call center, if customers activated their PERS pendants the system would not be able to connect with the call center. First responders on Orcas Island unsuccessfully attempted to get the phone numbers of PERS customers from the companies to let them know their alert services were not currently working and to ensure that they were not in distress. During this event, at least two PERS customers needed medical attention and had attempted to activate their pendants. Because PERS were down, these individuals did not receive help until hours or days later. One individual who was discovered approximately two hours after he attempted to activate his PERS was helicoptered off-island to be treated but did not survive. A second was also taken off-island to be treated and did survive, but had spent two days on the floor before she was discovered (O'Brien, oral communication, June 5, 2014).

Although we did not identify research directly addressing the relationship between accessing PERS customer information and health outcomes, we did find some published information to supplement these expert opinions. We found that many leading emergency management agencies and organizations support the development of ways to identify vulnerable populations during disasters so that first responders can be informed and respond accordingly. The Centers for Disease Control and Prevention (CDC), the U.S. Department of Health and Human Services, the Washington Military Department Emergency Management Division, and other organizations and researchers have highlighted or recommended strategies for identifying and protecting vulnerable older adults during emergencies. These strategies include developing registries of vulnerable individuals and using Geographic Information Systems (GIS) to map vulnerable communities or individuals. Note: these strategies have not been evaluated for effectiveness, are not free from limitations, and are not supported by all experts; however they are being widely discussed as promising approaches to provide support to vulnerable communities during emergencies. . In addition, these strategies are largely framed as tools to help identify vulnerable individuals *before* a disaster rather than during an emergency as SSB 6554 would facilitate.^{2,8-11}

Two company representatives and one EMS expert did express concerns that if there was a data breach while first responders were holding this information that these vulnerable customers could be exploited. However, 5 of the 16 key informants indicated that first responders know how to protect medical and other confidential information as they work with protected information daily.

Magnitude and severity of health impacts

The magnitude of the health impacts of SSB 6554 would depend on a number of factors such as the number of PERS customers in Washington state, the number of emergency situations that impact the state, and the frequency with which first responders request and use PERS customer information. In a letter written to the bill sponsor in February of 2014 a representative from Philips HealthCare Home Monitoring estimated that their company, which had 14,461 active members at the time the letter was written, had 40% of the PERS market share in the state. Therefore, the company representative estimated there to be 36,000 PERS subscribers in Washington state.¹² Disasters are by nature unpredictable, so we cannot calculate how many of these customers would ever actually be impacted by the bill, but 36,000 Washingtonians would have the potential to be directly affected. In addition, Washington is subject to emergencies such as those that result from earthquakes, mudslides, and severe weather.¹³ Because emergencies are associated with serious injury and illness as well as death, the health impacts that this bill addresses could be severe.¹³

What are the demographics of PERS customers?

Due to the scarcity of literature on the demographics of PERS customers, we contacted randomly selected PERS companies to gather information on the demographics of their customers in Washington. Demographic information would provide us with an idea of which populations would be most directly impacted by this bill. The PERS company representatives that we interviewed did not provide demographic data on their customers either because they do not collect these data or because they were not able to access it. Four of the company representatives indicated that their PERS customers and/or their target audience are primarily older adults. Other populations that were mentioned as either target audiences or customers included:

- Adults living alone
- Individuals with chronic health conditions

- Women
- Vulnerable individuals

Fifteen of the 16 key informants provided their perceptions of the demographics of PERS customers based on their experiences either being dispatched to homes where PERS have been activated or through working with their communities in other capacities. All of these experts explicitly indicated that the majority of PERS customers are ‘vulnerable’ or ‘at-risk’ populations, or expressed that they are members of the following populations:

- Older adults (particularly older adults living alone or in assisted living facilities)
- Individuals living with disabilities
- Geographically isolated individuals
- Individuals with chronic illness
- Adults living alone
- Individuals with life-affecting medical conditions
- Individuals with limited mobility

What impacts would SSB 6554 likely have on health disparities?

Vulnerable individuals

There is strong evidence that at-risk or vulnerable populations such as older adults, individuals with disabilities or chronic conditions, individuals with limited mobility, and those living alone (i.e., the primary consumers of PERS services) are more likely than their counterparts to experience negative health outcomes during an emergency.¹⁻⁷ For example, data indicate that approximately 75% of the deaths in New Orleans during and after Hurricane Katrina were among older adults even though this population accounted for only 15% of the city’s population before the storm.⁷ Similarly, during the 1995 Chicago heat wave the heat-related deaths were highest among individuals with medical conditions and individuals who lived alone or who were socially isolated.³ Because experts indicate that PERS customers are primarily vulnerable individuals such as older adults with health conditions, SSB 6554 has potential to decrease the disproportionate negative impact of emergencies on these at-risk populations, thereby helping to decrease health disparities.

Disparities by income, education, race/ethnicity, and primary language

It is important to note that while PERS customers may be vulnerable individuals, not all vulnerable individuals are PERS customers. Even within populations of at-risk individuals, disparities likely exist. For example, low income older adults may be more vulnerable to disasters than higher income older adults. Because we were unable to obtain demographic data on Washington state PERS customers, it is unclear if individuals who may be the most at-risk are proportionally represented among PERS customers. However, we were able to identify one article that provided some information on the demographics of PERS customers nationally. This 2001-2002 survey of older adults with disabilities suggested that there were minor if any differences between the race/ethnicity and education level of PERS users versus nonusers in the study.¹⁴

There was disagreement among the key informants as to whether or not all subpopulations have access to PERS services and would therefore benefit from this bill. Six of the 16 key informants indicated that low income individuals likely cannot afford the activation and monthly fees, and therefore do not have equitable access to PERS. As a result, these key informants believed the bill may not guarantee that the most vulnerable individuals are being reached in an emergency. In contrast, 6 of the experts indicated that PERS are used by individuals from all incomes and the bill would therefore have equitable benefits.

The remaining experts (n=4) did not provide any information on the income demographics of PERS customers. None of the experts provided information on education levels, racial/ethnic demographics, or primary languages of customers.

Four of the industry representatives also indicated that cost can be a barrier for customers, therefore low income individuals may not be proportionally represented among PERS users. However, in Washington state, Medicaid does cover PERS services for clients enrolled in specific programs. Debbie Johnson, Department of Social and Health Services (DSHS) Waiver Program Manager, indicated that Medicaid covers PERS services for about 9,000 individuals statewide (Johnson, written communication, June 5, 2014), indicating that at least some lower income individuals have access. Using the approximation that there are 36,000 PERS subscribers in Washington,¹² an estimated 25% of subscribers have their PERS services covered through Medicaid.

Michael Smith (Washington State Department of Health EMS Terrorism and Disaster Response Consultant), Scott Hogan (Washington State Department of Health EMS and Trauma Care Regional Consultant) and Stephen Riehl (Program Manager for Washington State Health Care Authority's Non-Emergency Medical Transportation Program) provided information on systems currently used in Washington to identify at-risk individuals. These experts indicated that when they analyze the bill in the context of the network of systems available in the state to serve at-risk populations during emergencies, they feel the bill would supplement other systems that already exist. They expressed that SSB 6554 would therefore not lead to a situation in which only higher income older adults, for example, are being identified. These experts mentioned two systems that are currently being used in Washington—one from the Health Care Authority and one from DSHS (Smith, Hogan, and Riehl, oral communication, June 4, 2014).

The Health Care Authority administers a [Non-Emergency Medical Transportation Program](#) that provides Medicaid patients with transportation to healthcare appointments. In addition, these brokers can act as points of contact for local EMS during emergencies as they are already familiar with these vulnerable individuals and know how to reach them. The Department of Health also uses this transportation program as a component of Washington's emergency planning (Smith, Hogan, and Riehl, oral communication, June 4, 2014). Sue Bush, Director of the DSHS Office of Emergency Management, provided information about the system that DSHS maintains. The agency developed an automated system that can be used to identify the physical location of vulnerable clients, their support needs, and their service providers. A search may be done using any pre-set or customized geographic area statewide (i.e. city, county, zip code, legislative district). DSHS has used the system during emergencies (e.g. wildfires, mudslides, windstorms) to provide local first responders with information regarding the physical location of very vulnerable people who may need assistance (Bush, written communication, June 9, 2014). In addition local EMS systems may have their own identification systems in place.

These systems are continuing to expand the number of individuals that they capture and already include many individuals who are using Medicaid or other social and health services; however, they do not capture all vulnerable individuals in the state. Mr. Smith, Mr. Hogan, and Mr. Riehl indicated that SSB 6554 has the potential to fill gaps in the current systems and increase the percentage of vulnerable individuals that are identified during an emergency.

Rural versus urban disparities

We were unable to find data on the geographic distribution of PERS customers in Washington. Although most of the industry representatives that we spoke with indicated they provide services in both rural and urban areas and the local experts that we interviewed across the state indicated they have PERS

customers living in their areas, we were not able to determine if customers are proportionally distributed across rural and urban areas of the state.

The literature does indicate that rural areas are uniquely impacted by emergencies.^{8,15} The key informants we spoke with disagreed about whether SSB 6554 would have different impacts on rural versus urban areas. A few key informants indicated that rural areas may see greater benefits from SSB 6554 because they have fewer redundancies in telecommunication systems, may be more likely to see telecommunication and power systems go offline, may be more likely to experience delays in getting these systems back online, and likely have fewer resources to respond to disasters than urban areas. An equal number of key informants, however, indicated that while rural areas may face these types of difficulties, they have more resilience, social cohesion, and independent back-up systems than urban areas and that these assets help protect rural communities. The literature also supports these assertions, providing evidence for both the challenges and protective factors in rural communities.^{8,15}

Annotated References

1. Al-rousan TM, Rubenstein LM, Wallace RB. Preparedness for natural disasters among older US adults: a nationwide survey. *American Journal of Public Health.* 2014;104(3):506-511.

Al-rousan et al. cite evidence indicating that the high rate of chronic conditions, activity limitations, physical and cognitive disabilities, and sensory impairments make older adults highly vulnerable to physiological stresses during disasters. The authors analyzed data from the national Health and Retirement Study (n=1304). Individuals younger than 50 years of age and those living in nursing homes and other institutions were excluded from the study. This study included 18 disaster-preparedness indicators such as having a fire detector, having a disaster plan, and having a three-day supply of food, water, and needed medications. Overall preparedness was measured by summing the scores for each indicator. When analyzing overall preparedness (not individual indicators) the authors found that higher age, physical disability, lower educational attainment, and lower income were each significantly associated with being less prepared for a disaster. Race/ethnicity, sex, marital status, and living alone were not significantly associated with overall preparedness. About two thirds of the respondents (all over age 50) did not have an emergency plan, had never participated in any disaster preparedness education, and were not aware of available resources—and level of preparedness decreased with increasing age. In addition, the authors indicate that emergency plans for older adults should include contingencies that do not rely solely on family members and informal caregivers who may also be incapacitated during a disaster. In addition, social isolation may prevent some older adults from receiving warning signals before a disaster, asking for help, or being identified as missing following a disaster, thereby increasing their vulnerability. Older adults may also not have access to a personal vehicle which may prevent them from evacuating before, during, or after an emergency.

2. Aldrich N, Benson WF. Disaster preparedness and the chronic disease needs of vulnerable older adults. *Preventing Chronic Disease.* 2008;5(1).

Aldrich and Benson provide a summary of the evidence highlighting the special needs of vulnerable older adults during an emergency. They indicate that older adults with serious, chronic health problems are more likely than younger or healthier individuals to need extra assistance during a disaster. The authors also outline evidence from past disasters indicating that older adults are more likely to encounter serious injury or death during an emergency than their counterparts. For example, during the 1995 heat wave in Chicago, the median age of the 465 people who died from heat-related issues was 75 years. The authors also reference recommendations that experts in emergency preparedness have made in response to the risk that older adults face during disasters. These include using “mapping systems to identify areas with high concentrations of older adults” and improving “identification and tracking methods for older adults and their health information.”

3. Banks L. Caring for elderly adults during disasters: improving health outcomes and recovery. *Southern Medical Journal.* 2013;106(1):94-98.

Banks’ review article outlines the unique risks that older adults face during an emergency. For example, older adults often face immobility, cognitive impairment, visual or hearing impairments, and social isolation which can make them “virtually invisible to rescue and recovery efforts.” During the 1995 Chicago heat wave, the risk of heat-related deaths was highest among individuals with known medical conditions which confined them to bed, individuals who did not leave home each day, and those who lived alone.

4. Bethel JW, Foreman AN, Burke SC. Disaster preparedness among medically vulnerable populations. *American Journal of Preventive Medicine.* 2011;40(2):139-143.

Bethel et al. analyzed Behavioral Risk Factor Surveillance System (BRFSS) data from six states to determine the relationship between emergency preparedness and a) perceived health status, b) disability status, and c) number of chronic diseases. They controlled for potential confounding factors such as age, education, income, and race/ethnicity, and found that individuals with self-rated “fair” or “poor” health or activity limitation due to health issues had significantly lower odds than their counterparts of having their house stocked with specific preparedness items. However, individuals with self-rated fair or poor health, activity limitation, or chronic disease were more likely to have at least a three-day supply of their medications than their counterparts. The researchers also measured the difference between different populations' likelihood of having an emergency evacuation plan and found that respondents with activity limitations due to health issues had significantly lower odds of having an emergency evacuation plan than their counterparts but that respondents with a health problem requiring special equipment had significantly higher odds than their counterparts of having an evacuation plan. The authors indicate that while other studies have also found mixed results in relation to vulnerable populations preparedness for disaster, they highlight seven studies which indicate that vulnerable populations (such as those with poor health, disabilities, and chronic diseases) are at an increased risk of negative health outcomes as a result of natural disasters.

5. Chiu CH, Schnall AH, Mertzluft CE, et al. Mortality from a tornado outbreak, Alabama, April 27, 2011. *American Journal of Public Health*. 2013;103(8):52-58.

Chiu et al. analyzed the demographics of the decedents during a tornado outbreak in Alabama in 2011. The researchers used death certificates, interview data collected by American Red Cross volunteers, and disaster-related mortality surveillance data. They found that females, older adults (65 years and older), white individuals, and individuals from rural areas were at significantly higher risk for tornado-related deaths than their counterparts. Adults over the age of 85 were nearly four times more likely to die in the tornadoes than 45-54 year olds (RR 3.85 95% CI 2.05-7.26). Note that the authors did not indicate that they controlled for potential confounding factors. They did, however, indicate that the white decedents were on average older than the black decedents indicating that age may have been a confounding factor in the race/ethnicity relative risk ratios. The authors also cite six additional studies which have found that older adults are at increased risk for tornado-related deaths. Cited evidence supports that preexisting health issues, reduced mobility, increased vulnerability to trauma, and a higher likelihood of living in an older dwelling are contributing factors in increasing the vulnerability of older adults during and after tornados.

6. Flanagan BE, Gregory EW, Hallisey EJ, Heitgerd JL, Lewis B. A social vulnerability index for disaster management. *Journal of Homeland Security and Emergency Management*. 2011;8(1).

Flanagan et al. describe the development of a social vulnerability index which is intended to help disaster management officials locate their most vulnerable populations. The authors provide a list of populations that tend to be more vulnerable during emergencies. These groups include economically disadvantaged, communities of color, older adult populations, individuals living with a disability, and those who are not fluent in English. They cite seven studies published between 1990 and 2007 which indicate that older adults living alone and people of any age who have cognitive, physical, or sensory challenges are at higher risk during a disaster than their counterparts.

7. Wingate MS, Perry EC, Campbell PH, David P, Weist EM. Identifying and protecting vulnerable populations in public health emergencies: addressing gaps in education and training. *Public Health Reports*. 2007;122(3).

Wingate et al. outline gaps in resources for vulnerable populations during disasters. In addition they highlight data from Hurricane Katrina in 2005 which indicate that many vulnerable populations (e.g.

older adults, individuals with disabilities, low income individuals) suffered disproportionately during and after the hurricane. For example, approximately 75% of deaths in New Orleans were among older adults even though this population accounted for only 15% of the city's population before the storm.

8. Centers for Disease Control and Prevention. *Identifying Vulnerable Older Adults and Legal Options for Increasing Their Protection During All-Hazards Emergencies: A Cross-Sector Guide for States and Communities*. U.S. Department of Health and Human Services. 2012.

This report indicates that older adults have characteristics that make them more vulnerable to illness and death during emergencies. It also provides specific examples of disasters in which older adults have been disproportionately impacted. In addition, this report provides an outline of strategies that are being used across the United States to identify vulnerable older adults. These strategies include developing registries of vulnerable individuals and using Geographic Information Systems (GIS) to map vulnerable communities or identify locations of vulnerable individuals. The authors indicate that these strategies have not been evaluated for effectiveness, but they are being supported by emergency management experts across the country. This report also includes a brief section on preparing for emergencies in rural areas. It indicates that rural communities face challenges during emergencies such as fewer resources, less funding, and isolation from services. It also indicates, however, that rural communities have strengths such as a strong sense of community, independence, self-reliance, and preparation.

9. Washington Military Department Emergency Management Division. *Planning Considerations for High Risk Individuals in the Puget Sound Region*. 2010.

This document provides considerations for emergency planners in the Puget Sound region to incorporate into emergency plans to support at-risk individuals during disasters. One of the considerations listed in this report is to maintain a pre-incident registration system for high risk communities. This registry is intended to increase awareness of pre-incident planning needs in the community and to reduce the number of high-risk individuals who do not evacuate during an emergency.

10. U.S. Department of Health and Human Services webpage. *Registries: An Emergency Planning Tool*. Page last reviewed November 20, 2013; <http://www.phe.gov/Preparedness/planning/abc/Pages/registries.aspx>. Accessed July 24, 2014.

This webpage defines registries as voluntary databases of individuals who meet requirements for receiving additional emergency response services based on need. Registries are highlighted as a useful tool to help emergency planners target resources and services to individuals who have special needs. In addition, the webpage indicates that registries can be further enhanced when the data are used for GIS mapping.

11. Chen J, Wilkinson D, Richardson RB, Waruszynski B. *Issues, considerations and recommendations on emergency preparedness for vulnerable population groups. Radiation Protection Dosimetry*. 2009;134(3-4):3-4.

A Workshop on Emergency Preparedness for Vulnerable Population Groups was held in 2009 in Canada. One goal of the workshop was to identify the gaps in emergency preparedness against chemical, biological, radiological, nuclear and explosives events for vulnerable populations. Workshop participants identified geographic/social mapping for needs and resources as one gap. This document indicates that there is a need to identify at-risk populations and resources and map their locations.

12. O'Brien, F. *Philips Opposition Letter—Senate Bill 6554. Philips Healthcare Home Monitoring*. February 10, 2014.

This letter was sent to Senator Ranker by Philips Healthcare Home Monitoring in opposition to a version of SB 6554. The letter outlines the company's concerns with the bill. The letter also indicates that

Philips had 14,461 active members at the time the letter was written, an estimated 40% of the PERS market share in the state. Therefore, the company representative estimated there to be 36,000 PERS subscribers in Washington state, which only represent about 10% of the state's subpopulation of adults who are aged 75 or older.

13. Washington Military Department Emergency Management Division webpage. Natural Hazards. http://www.emd.wa.gov/hazards/haz_natural.shtml. Accessed July 30, 2014.

The Washington Military Department Emergency Management Division webpage outlines the 9 main natural hazards that Washington faces: Avalanche, drought, earthquake, flood, landslide, sever storm, tsunami, volcano, and wildland fire. This website also mentions the risk to human life, property, and infrastructure associated with these hazards.

14. Mann WC, Belchior P, Tomita MR, Kemp BJ. Use of personal emergency response systems by older individuals with disabilities. *Assistive Technology*. 2005;17(1):82-88.

Mann et al. analyzed survey data that was collected through a semi-structured questionnaire in 2001 and 2002 (n=606). Participants were individuals 60 years and older with disabilities from New York, California, and Florida. Researchers recruited participants through a number of means including through a retirement community, the Rehabilitation Engineering Research Center's study participants core, and participants of Project Link. The authors explored the benefits of PERS as well as the barriers to accessing PERS. In addition they provide some data on the demographics of study participants that are PERS users as well as nonusers. They did not present an analysis of whether there were any significant demographic differences between the PERS users and nonusers, or provide confidence intervals which would enable the reader to interpreted if there were meaningful differences between the two populations. However, a superficial interpretation of the demographic data shows that the PERS users and nonusers appear to have similar racial/ethnic distributions. While a slightly higher percentage of nonusers had a high school degree or less, and a higher percentage of users reported living alone and being unmarried, it is not clear if these differences are significant. In addition 37% of nonusers reported that cost was one reason that they were not using a PERS.

15. Prelog AJ, Miller LM. Perceptions of disaster risk and vulnerability in rural Texas. *Journal of Rural Social Sciences*. 2013;28(3):1-31.

Prelog and Miller provide an extensive literature review of the factors that make rural areas uniquely vulnerable to disasters. These include lack of resources, high proportions of low income residents, dependence on economies tied to natural resources which can be heavily impacted by disasters, geographical isolation, and lack of rapid response from outside assistance. The authors also highlight evidence though, that rural areas are more resilient, have high levels of social capital and community trust, and strong social networks.

Appendix A. Selection of Experts and PERS Company Representatives

Selection of Experts

In order to ensure that the experts contacted were geographically diverse and were selected without bias, we randomly selected 11 Washington counties. These randomly selected counties were evenly distributed geographically, but did not include any highly urbanized counties. To address this gap, we also included King and Spokane Counties as a way to ensure that representatives from both rural and urban counties were contacted. Because San Juan County experienced a telecommunications emergency in late 2013 that catalyzed the development of this bill, we also contacted the expert from San Juan County who managed this emergency in 2013.

In total, key informants from 14 counties were contacted. Except for in the case of San Juan County (where the expert was selected based on his involvement in the 2013 telecommunication outage) we selected a department within each county that focuses on emergency medical services (e.g. fire department, sheriff's department, emergency communications department, emergency medical services) and asked to be directed to an expert in the county that would be able to provide information on the likely impacts of SSB 6554.

We successfully interviewed experts in 11 of the 14 counties (~79% response rate). We have calculated the response rate based on the percentage of counties who responded rather than based on individuals contacted because individuals within each county often redirected us to the expert in their department or county who they felt could provide the highest level of expertise. Our first contact in Thurston County also suggested that we connect with a second expert in the county in order to supplement his interview. For this reason we have two key informants from Thurston County. In addition, many of our key informants have worked or currently work in multiple counties, coordinate EMS in regions that include multiple counties, or work for health districts that include multiple counties. We also interviewed four experts who work at the state level who we identified using snowball sampling: two from the Washington State Department of Health, one from the Washington State Health Care Authority, and one who sits on the Washington State Board of Health. Therefore, in total, we interviewed 16 key informants. Throughout this review we report the proportion of the 16 experts who provided a particular opinion.

Three representatives from the Washington State Department of Social and Health Services and two from the Washington Military Department, Emergency Management Division also provided consultation and information during this analysis. Figure 2 provides an outline of the individuals contacted during this review.

Selection of PERS Company Representatives

We compiled a list of companies that offer PERS in Washington state using Google searches, online yellow pages, and resource lists provided for older adults in Washington. While we cannot be certain that this list of companies is comprehensive, we were able to identify 29 companies that offer PERS in the state. We randomly selected 7 of these companies to contact in an attempt to compile aggregated data on the populations using PERS. We first screened these companies to ensure that they provide PERS as they are defined by the SSB 6554 and that they serve individuals residing in Washington state. Six of these 7 companies responded (~86% response rate). We also contacted one additional company representative through snowball sampling. We therefore spoke with a total of 7 companies who offer PERS services.

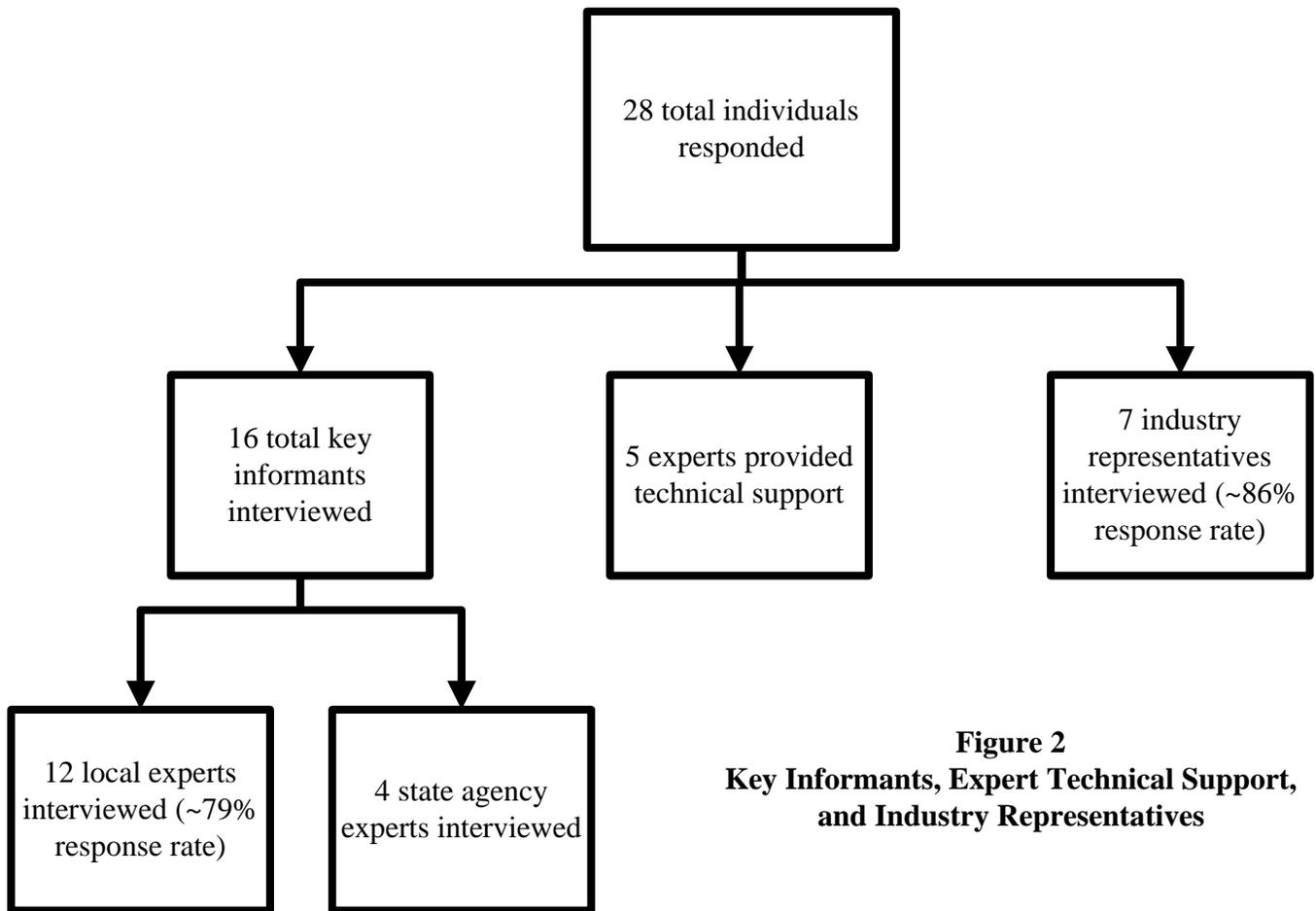


Figure 2
Key Informants, Expert Technical Support,
and Industry Representatives