Table 10. PHMSA pressure tank car incident data from 1971-2017 and equivalent release scenarios based on a sensitivity analysis of spill diameters.

Quantity Released in gallons	Incident Count	Probability	Release Scenario
≤ 100	5,297	0.955	No Release
100 < x ≤ 1,000	88	0.016	½-inch Leak
1,000 < x ≤ 30,000	142	0.026	2-inch Leak
> 30,000	15	0.003	Catastrophic

The LOC probabilities estimated here are based on data for all pressurized tank car accidents. As a comparison, Jeong developed a probabilistic puncture model for head impact to general tank cars as a function of wall thickness.[25] The author analyzed proprietary accident data collected since 1960 by the Railway Supply Institute and the Association of American Railroads (AAR). He found that a probabilistic model closely matched historical data reflecting a historical probability of approximately 1-3% for head puncture due to derailment or collision for jacketed vessels and 3-8% for non-jacketed vessels. These statistics are consistent with our analysis of the publicly available HAZMAT data from DOT as listed in Table 10 above (i.e., 4.5% total probability of LOC).

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[25] Jeong DY. Probabilistic Approach to Conditional Probability of Release of Hazardous Materials from Railroad Tank Cars During Accidents, Proceedings of IMECE2009, ASME International Mechanical Engineering Congress and Exposition, Lake Buena Vista, Florida, USA (November 13-19, 2009).