MITIGATING COSTS AND RISK OF

OIL PIPELINE ACCIDENTS

Kevin Lin, Wes Gurnee, Eamon Woods

FROM KAGGLE.COM

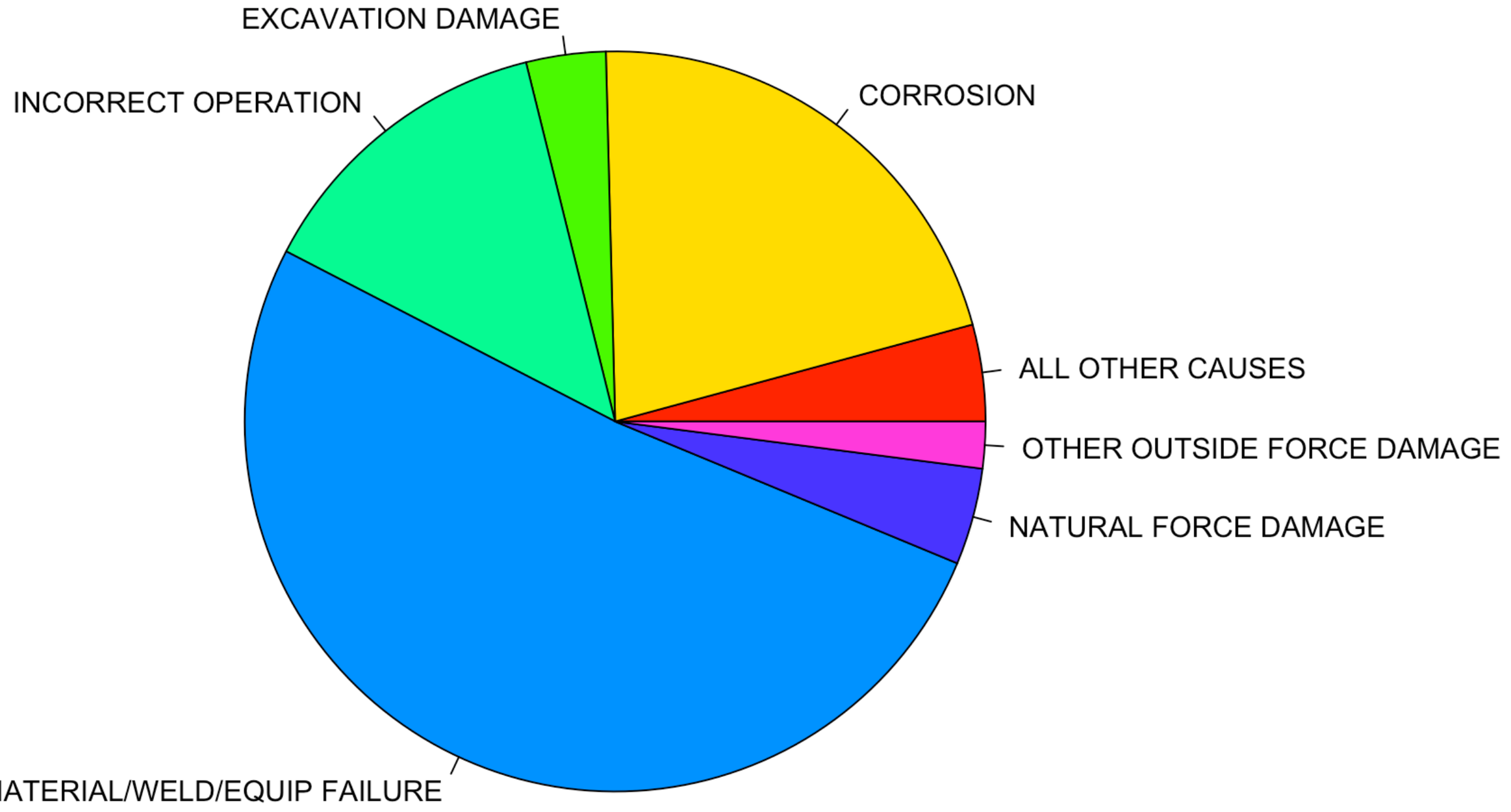
DATASET

- Open source data sourced reported from the Pipeline and Hazardous Materials Safety Administration since 2010
- All within the United States
- 2795 observations of 48 variables
- Example features: Incident date and time, operator and pipeline, cause of incident, type of hazardous liquid and quantity lost, injuries and fatalities, and associated costs

INTERESTING FINDS

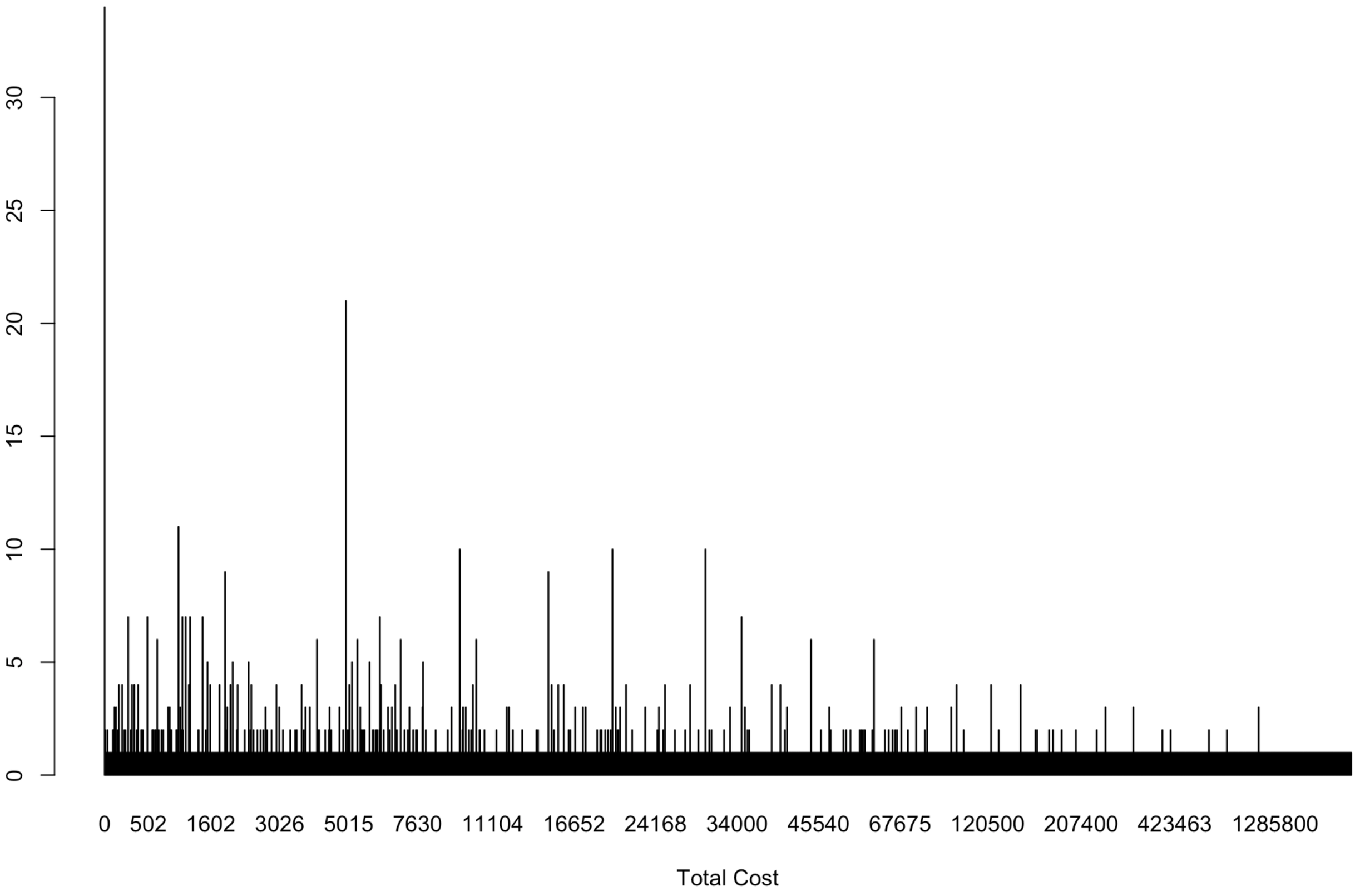
- only 18 offshore accidents->2,777 onshore accidents
- 95 cases of accidents associated with ignition
- 15 cases of accidents associated with explosion
- 20 cases of injuries; 10 cases of fatalities
- Perhaps not factored into costs, but extra concern for risk, and safety

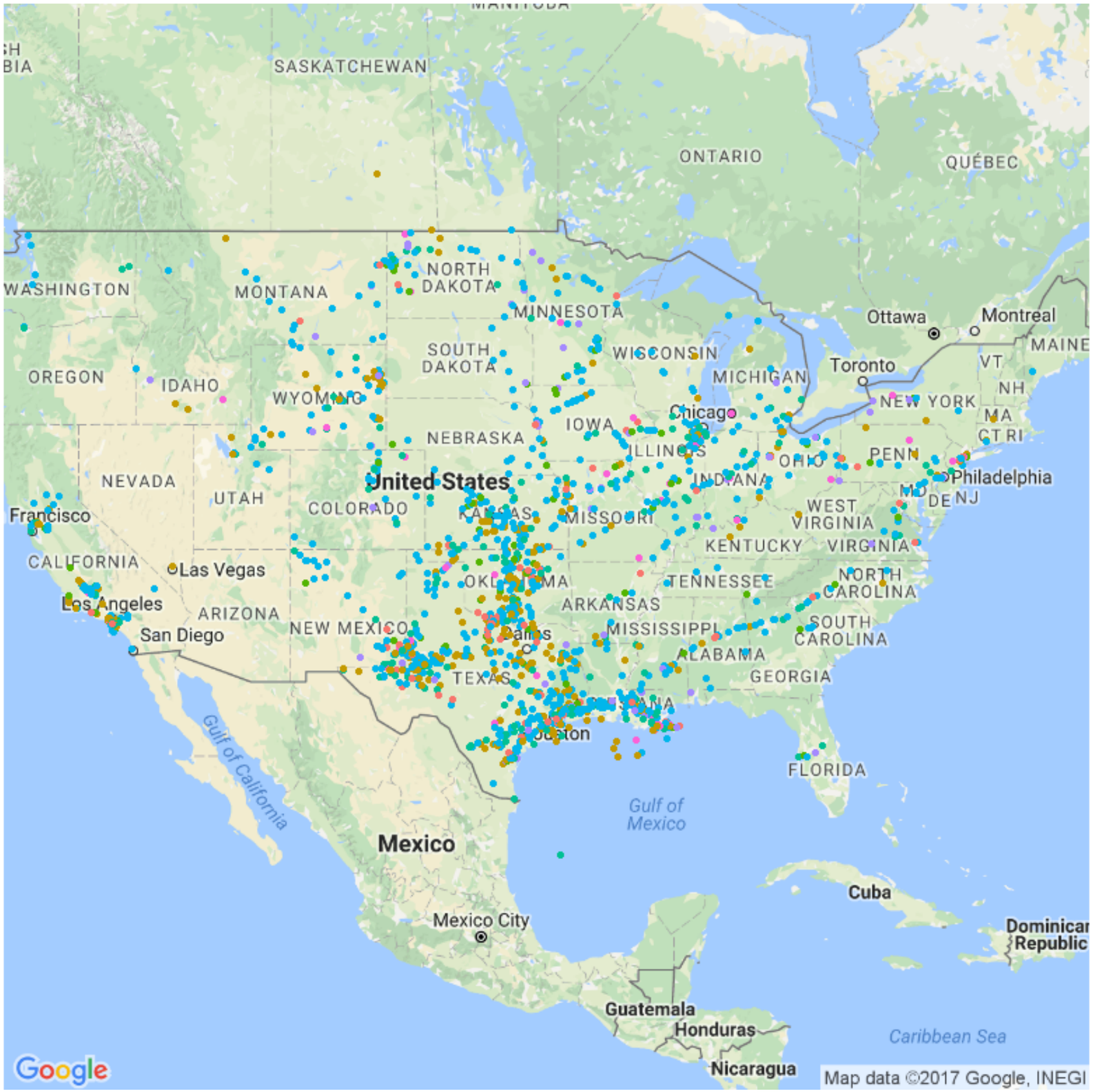
Distribution of Causes



COST VS CAUSE

	TOTAL COST	AVERAGE COST	MEDIAN COST
CORROSION	395,325,677	667,779.9	46,090
EXCAVATION DAMAGE	93,101,223	959,806.4	193,841
INCORRECT OPERATION	106,140,454	280,794.9	12,750
MATERIAL/WELD/ EQUIP FAILURE	1,243,774,427	866,741.8	15,030
NATURAL FORCE DAMAGE	220,354,295	1,867,409.3	48,200
OTHER OUTSIDE FORCE DAMAGE	161,602,026	2,835,123.3	273,100
ALL OTHER CAUSES	110,824,821	939,193.4	21,632


Cost Distribution
0
5
10
15
20
25
30
0
502
1602
3026
5015
7630
11104
16652
24168
34000
45540
67675
120500
207400
423463
1285800
Total Cost



Cause.Category

- ALL OTHER CAUSES
- CORROSION
- EXCAVATION DAMAGE
- INCORRECT OPERATION
- MATERIAL/WELD/EQUIP FAILURE
- NATURAL FORCE DAMAGE
- OTHER OUTSIDE FORCE DAMAGE

Sites of accidents follow transportation lines.

ANALYSIS OF MAP

- Most drilling is done in Texas and Oklahoma
- Corrosion is concentrated in the extraction sites in the south, not in the main transportation lines
- Material/equipment failure follows the transportation lines

Cause.Category

MATERIAL/WELD/EQUIP FAILURE


SASKATCHEWAN
ONTARIO
QUÉBEC
WASHINGTON
MONTANA
NORTH DAKOTA
MINNESOTA
SOUTH DAKOTA
WISCONSIN
MICHIGAN
Ottawa
Montreal
Toronto
MAINE
VT
NH
NEW YORK
MA
CT RI
PENN
Philadelphia
MD
DE
NJ
OREGON
IDAHO
WYOMING
NEBRASKA
IOWA
Chicago
ILLINOIS
INDIANA
OHIO
WEST VIRGINIA
KENTUCKY
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
United States
Francisco
CALIFORNIA
Las Vegas
Los Angeles
San Diego
ARIZONA
NEW MEXICO
OKLAHOMA
ARKANSAS
TENNESSEE
Dallas
MISSISSIPPI
ALABAMA
GEORGIA
TEXAS
LOUISIANA
Houston
FLORIDA
Gulf of California
Gulf of Mexico
Mexico
Cuba
Mexico City
Dominican Republic
Guatemala
Honduras
Nicaragua
Caribbean Sea
Google
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Cause.Category
INCORRECT OPERATION


SASKATCHEWAN
ONTARIO
QUÉBEC
WASHINGTON
MONTANA
NORTH DAKOTA
MINNESOTA
Ottawa
Montreal
MAINE
SOUTH DAKOTA
WISCONSIN
MICHIGAN
Toronto
VT
NH
OREGON
IDAHO
WYOMING
NEW YORK
MA
CT RI
Chicago
NEBRASKA
IOWA
ILLINOIS
OHIO
PENN
Philadelphia
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
INDIANA
MD
DE
NJ
WEST VIRGINIA
KENTUCKY
VIRGINIA
CALIFORNIA
Las Vegas
OKLAHOMA
TENNESSEE
NORTH CAROLINA
Los Angeles
ARIZONA
NEW MEXICO
San Diego
Dallas
ARKANSAS
MISSISSIPPI
SOUTH CAROLINA
ALABAMA
GEORGIA
TEXAS
LOUISIANA
Houston
FLORIDA
Gulf of California
Gulf of Mexico
Mexico
Cuba
Mexico City
Guatemala
Honduras
Nicaragua
Caribbean Sea
Google
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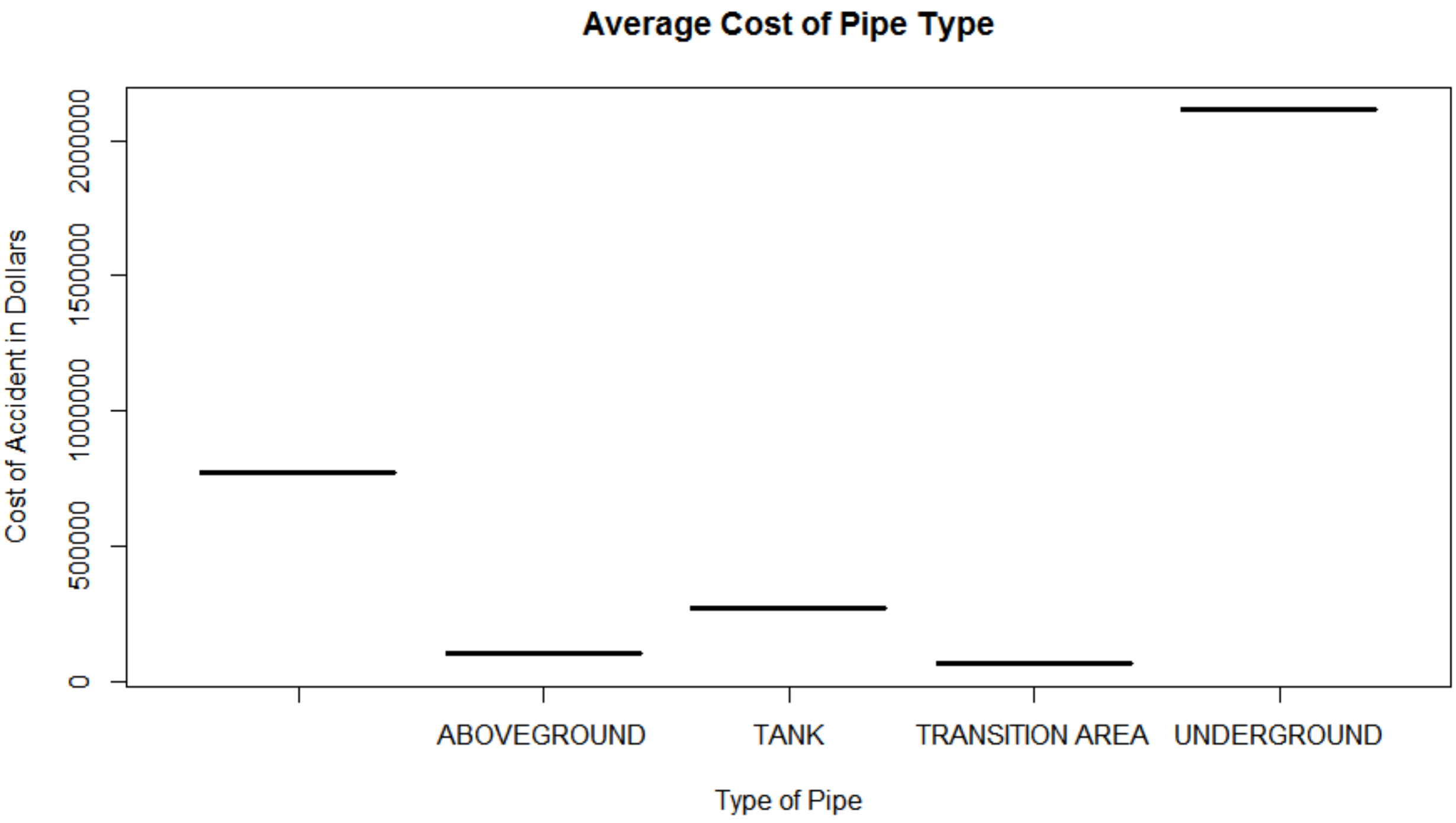
Cause.Category
CORROSION


Average Cost of Pipe Type
Cost of Accident in Dollars
0
500000
1000000
1500000
2000000
ABOVEGROUND
TANK
TRANSITION AREA
UNDERGROUND
Type of Pipe

MODEL

RECOMMENDATIONS

- Look at importance of predictors compared to total cost.
- Optimize to minimize cost

RECOMMENDATIONS PT. 2

- Extra cost during special cases of ignition and explosions
- These are obviously extra-negative for publicity and safety
- Main subcauses for ignition: lightning, incorrect operation, pump-related equipment
- Main subcauses for explosion: manufacturing and installation
- Incorrect operation and material/weld/equip failure is the cause of majority of ignitions and explosions