

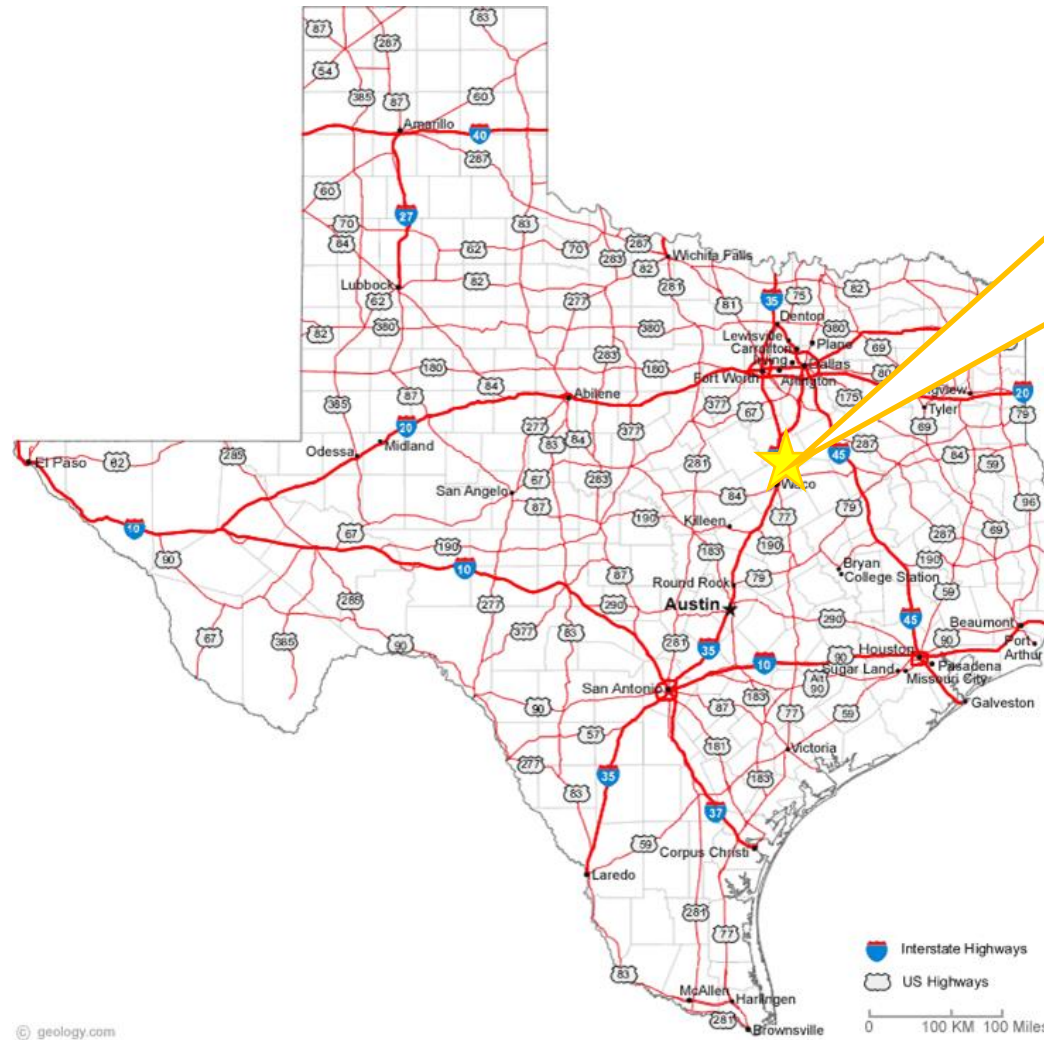
Long-Term Mental Health Assessment after the West, Texas Fertilizer Plant Explosion

Kahler W. Stone, DrPH, MPH¹; Brianna Proctor, MPH²; Vaidehi Shah, MPH²;
Lacey Sanders, MPH²; Dylan Bogle, BS¹; Nickie Brillion, MS¹; Bethany Wrye,
PhD, MCHES¹

1) Public Health Program, Middle Tennessee State University

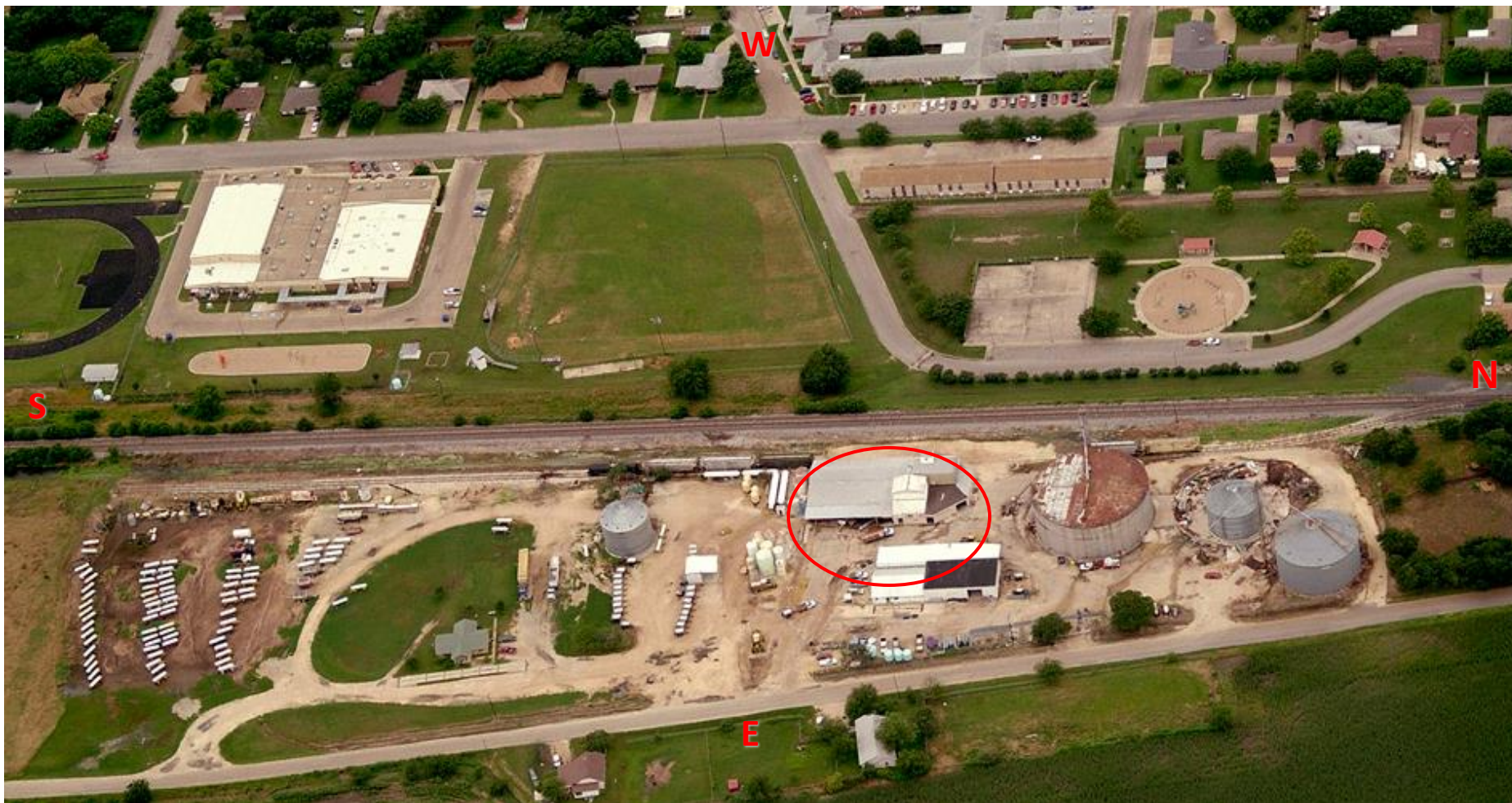
2) Waco-McLennan County Public Health District

Background



West, Texas
(McLennan Co)

Population (2013): 2834
Area: 1.54 mi²



Source: Dallas Morning News



Source: Dallas Morning News

Apartment complex destroyed



Source: Associated Press

Magnitude of Explosion

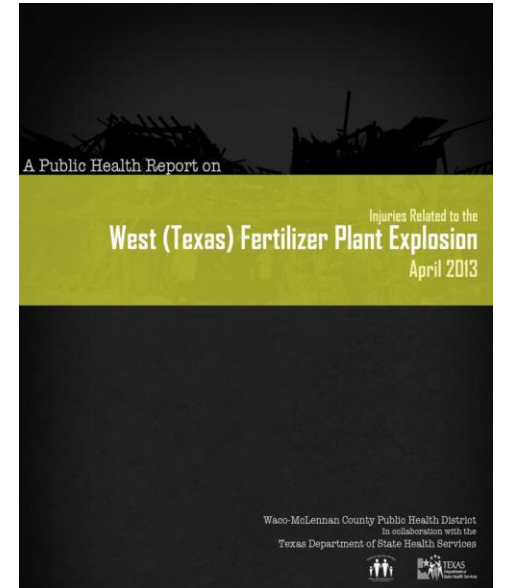
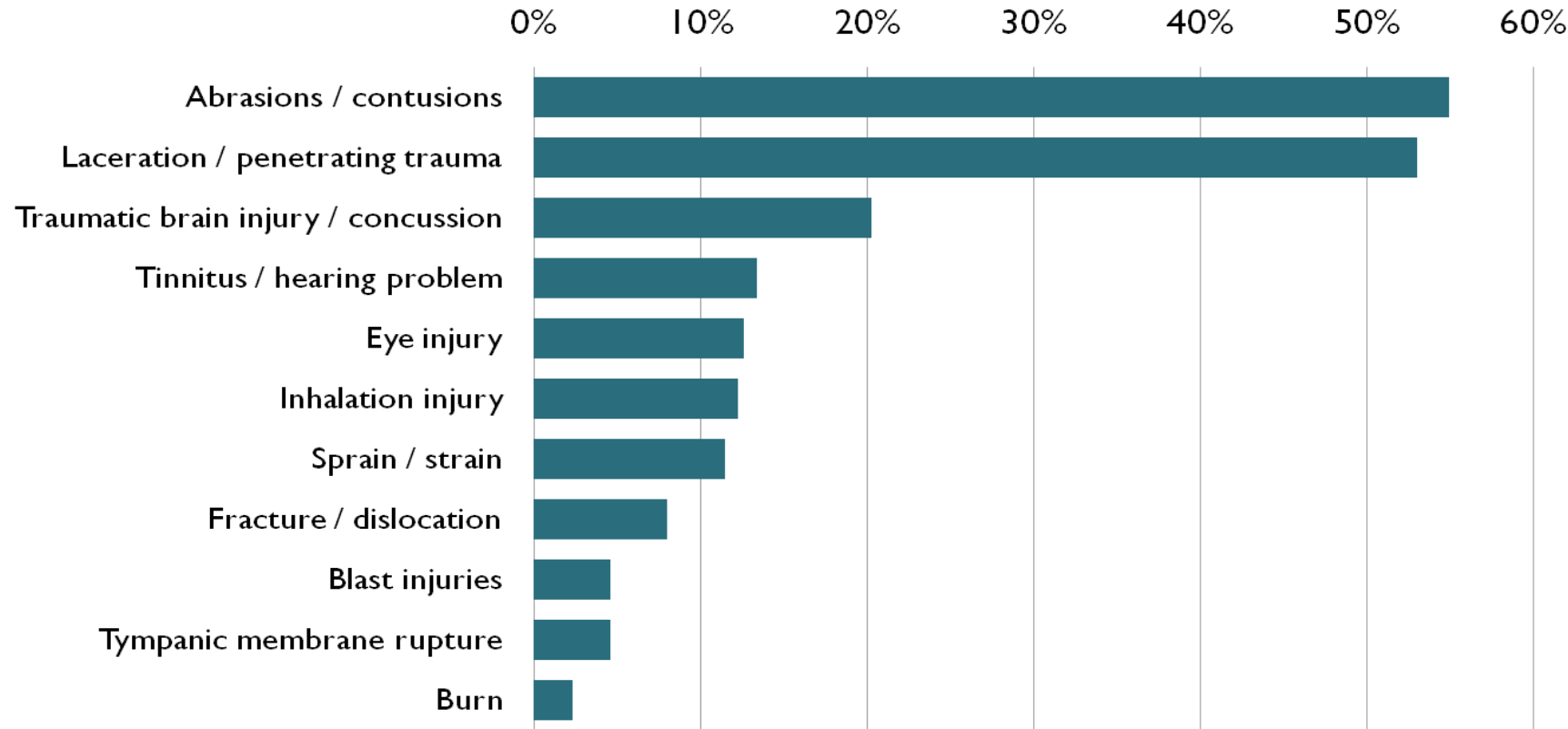
- 28-34 tons of ammonium nitrate exploded (another 120 tons did not explode)
- Registered as 2.1 magnitude earthquake
- Felt over 30 miles away
- Blast crater approx. 10 feet deep and 100 feet wide
- Flaming debris causes fires over a half mile
- Farthest piece of debris found 2.5 miles away



Source: Associated Press

Injury Investigation / Community Assessment Findings

Proportion of Patients by Type of Injury (N=262)



www.wacomclennanphd.org

<http://www.waco-texas.com/userfiles/cms-healthdepartment/file/pdf/West-Texas-Report-6-2014.pdf>

Manuscript reference:

Metzger, K., Akram, H., Feldt, B., Stone, K., Alvey, S., Henley, S., Hernandez, A., Melville, S., Haywood, T., Zane, D. (2016). Epidemiologic Investigation of Injuries Associated With the 2013 Fertilizer Plant Explosion in West, Texas. *Disaster Medicine and Public Health Preparedness*, 1–8. <https://doi.org/10.1017/dmp.2015.186>



Public Health

MIDDLE TENNESSEE STATE UNIVERSITY

I AM *true*
BLUE

Background

Psychological distress can last more than 10 years post-event
(Neria et al., 2008)

PTSD (post-Traumatic stress disorder) (Goldman & Galea, 2014)

- Human made disasters were associated with higher odds of PTSD compared to natural disasters (Bromet et. al, 2017)

Depression

- Likely most common mental illness due to large overall burden regardless of disaster (Goldman & Galea, 2014)

Substance Use Disorder

Generalized Anxiety Disorder (GAD)

Objective

This assessment aimed to assess subsequent chronic health conditions including substance use disorder and mental health among community members in West, Texas, following the 2013 fertilizer plant explosion some six years after the event.



Methods

35-item questionnaire

- Basic demographics
- PTSD 8-item scale (PTSD-8)
- Generalized psychological distress 6-item scale (Kessler-6)
- Substance Use
- Chronic illnesses
- Explosion experiences



Methods

Attempted household census

Survey could be filled out online or in-person

- Parcel data to create household frame for City of West (N=1066 HHs)
- Mailed postcards to all residential households with unique code

How is your health since the explosion?



The Waco-McLennan County Public Health District is conducting a survey to identify long-term health impacts from the April 2013 West Fertilizer Plant Explosion. Your participation in this survey will provide valuable information on the health issues facing the residents of West. Your responses are anonymous and confidential.

The survey can be completed online: **www.westfollowup.org**

If you are unable to complete the survey online, survey teams will be in West during the weeks of April 22-May 3, 2019



Public Health

MIDDLE TENNESSEE STATE UNIVERSITY

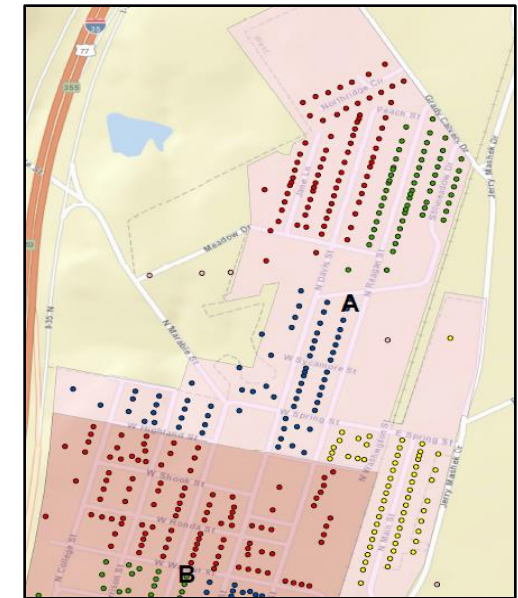
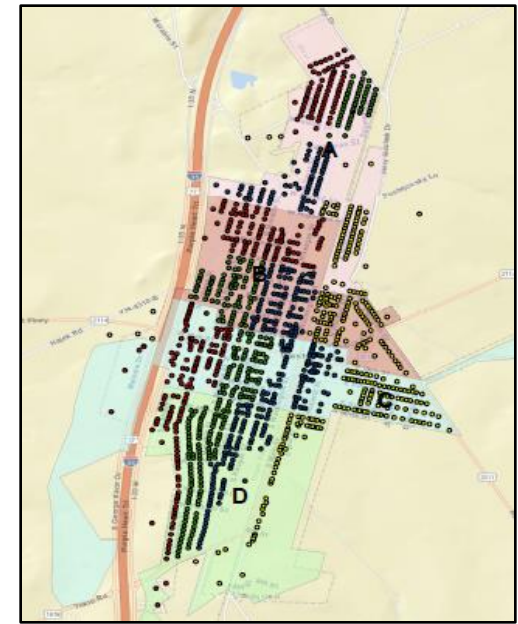
I AM *true*
BLUE

Methods

Attempted household census

Survey could be filled out online or in-person

- Door-to-door surveying (N=965)
 - Used Zones (A,B,C,D) / Subzones (1,2,3,4)
 - Approach HH who have NOT completed online survey or not refused.
 - Tracking similar to CASPER, adding HH when found.
- Leave door-hangers after 2 physical attempts (N=210)



Results

- 373 completed HH questionnaires online (N=224) and in-person (N=149)
- HH Response rate = 38.6%
- The majority of respondents identified as **White (85%)** had an average **household size of 2.5 people** and were still currently living in West at the same address as the time of the explosion (76%).
- Respondents residing in West during the explosion, **approximately 90% were in town the evening of the blast.**

Results

One respondent said,

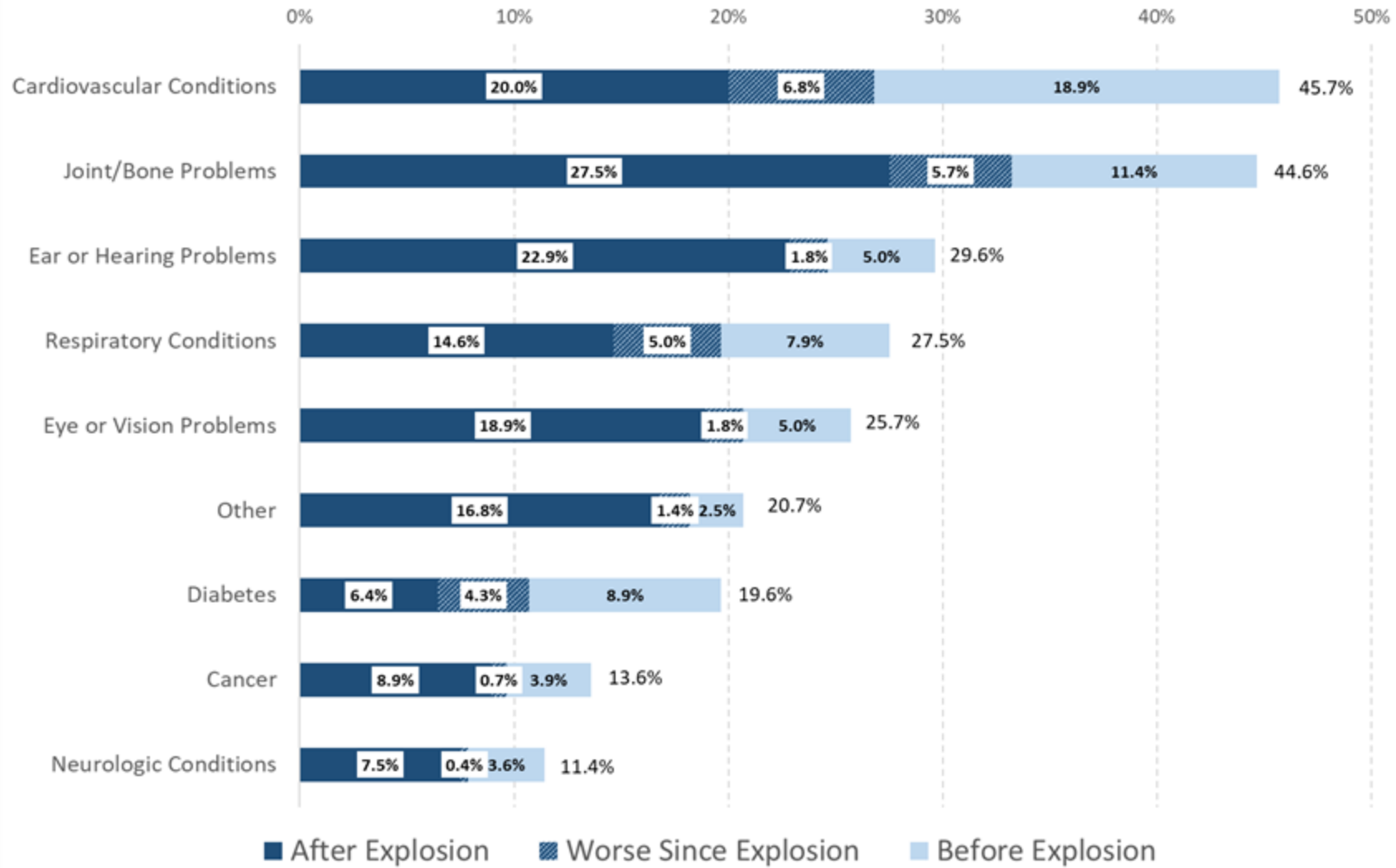
"people everywhere covered in blood, pieces of everyone's house spread all over this side of town, it's a little hard to describe it all. Very traumatic."

Reported Explosion Experiences (N=285)

	%	Frequency
In Danger During Blast	50	142
Fled/Escaped for Protection	55.3	157
Saw Flames and/or Smoke	80.3	228
Exposed to Vapors, Gases, Dusts, Fumes	60.6	171
Encountered Disturbing Scenes*	54.9	156
Damaged Homes or Property	44.1	64
Others Physically Injured	39.3	57
Fear or Confusion	20	29
Fire or Explosion	12.4	18
Physical Injury	9.7	14
Participated in Emergency Response	9.7	14
Emergency Response	7.6	11
Loss of a Loved One	4.8	7
Other	6.2	9
Did Not Specify	7.6	11
* Respondents may have encountered multiple disturbing scenes		



Health Conditions Reported by Respondents Before and After the Explosion (N=285)



Results

Proportion of changes in substance use behavior since explosion (N=285)

	Never Used / No Change	Started Using	Increased Use	Prefer not to Answer
Alcohol Products	76.1	1.8	15.9	6.2
Drugs not Prescribed*	85.4	6.2	3.7	4.7
Street Drugs**	92.3	0.7	1.5	5.5
Tobacco Products	84.4	1.5	10.9	3.3

*Drugs not prescribed by a doctor such as Oxycontin, Percocet, Norco, Xanax, Valium, Ambien, Ritalin, Adderall, Mydayis, Dexedrine, or others

** Any street drugs like marijuana, meth , heroin, crack and/or others



Results

A respondent stated,

"...hearing damage and PTSD/depression issues. I did not see medical treatment at the time due to lack of money. I only started seeking help last year since I moved back in with my mother and was able to finally save enough money to see a therapist and get on medication."

Mental Health Indicators in Respondents (N=285)

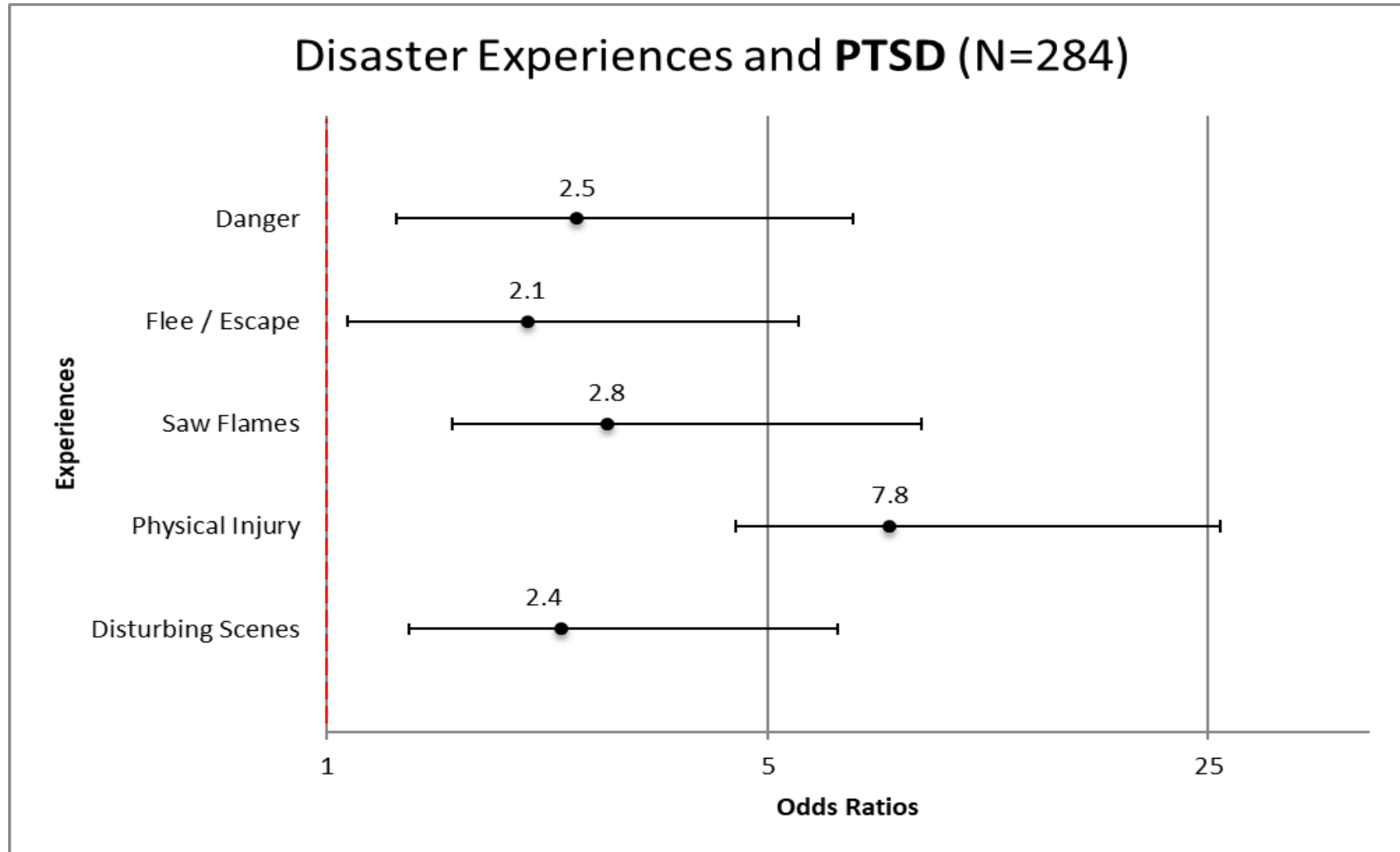
	Mean (Range) or % (N)
Mental Health Days	7.8 (0 - 30)
At least 14 days of poor mental health	29.1 (78)
PTSD (≥ 21 scale cut-off)	44.0 (120)
General Mental Illness (K6)	42.6 (152)
Moderate Mental Illness (5-12 scale score)	26.6 (95)
Severe Mental Illness (≥ 13 scale score)	16.0 (57)

Results

PTSD-8 Scale Breakdown (N=284)

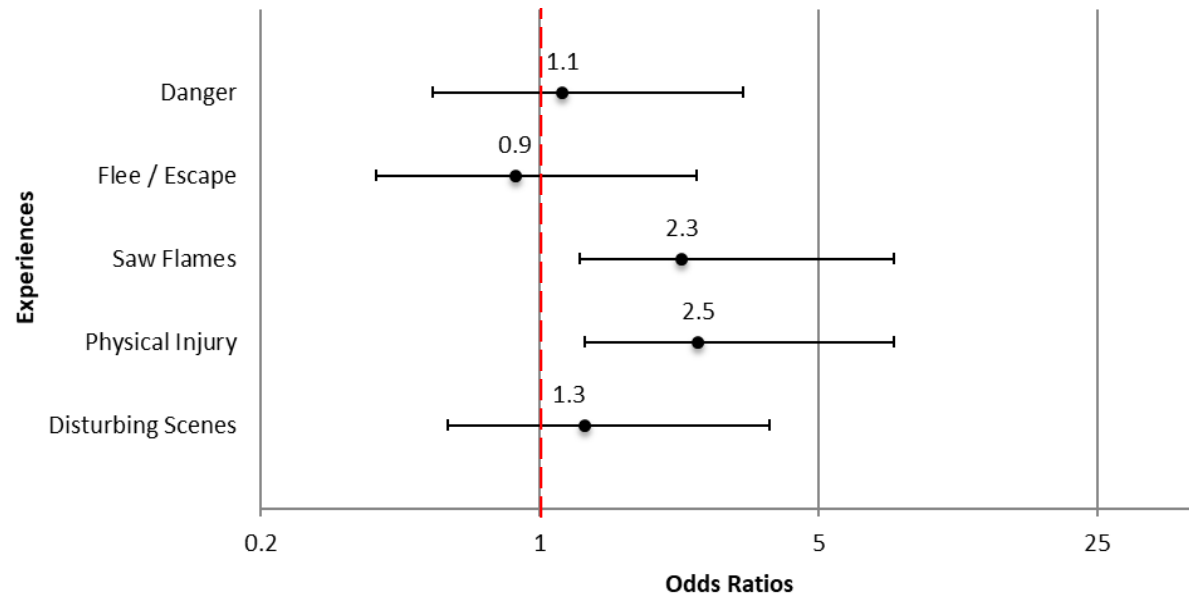
		Not at all	Rarely	Sometimes % (N)	Most of the time
Intrusion 79% at least one item ≥ 3	Recurrent thoughts	18.3 (50)	15.7 (43)	50.2 (137)	15.7 (43)
	Feelings as though it is happening again	5.1 (14)	53.8 (147)	18.7 (51)	22.3 (61)
	Recurrent nightmares	5.1 (14)	57.1 (156)	17.6 (48)	20.1 (55)
	Sudden emotional or physical reactions	20.1 (55)	32.6 (89)	14.6 (40)	32.6 (89)
Avoidance 45% at least one item ≥ 3	Avoiding activities	18.7 (51)	48.3 (132)	13.2 (36)	19.8 (54)
	Avoid feelings or thoughts of event	15.7 (43)	45.1 (123)	12.8 (35)	26.4 (74)
Hypervigilance 44% at least one item ≥ 3	Feeling jumpy	22.3 (61)	39.5 (108)	12.1 (33)	26.0 (71)
	Feeling on guard	27.1 (74)	45.8 (125)	9.9 (27)	17.2 (47)

Results

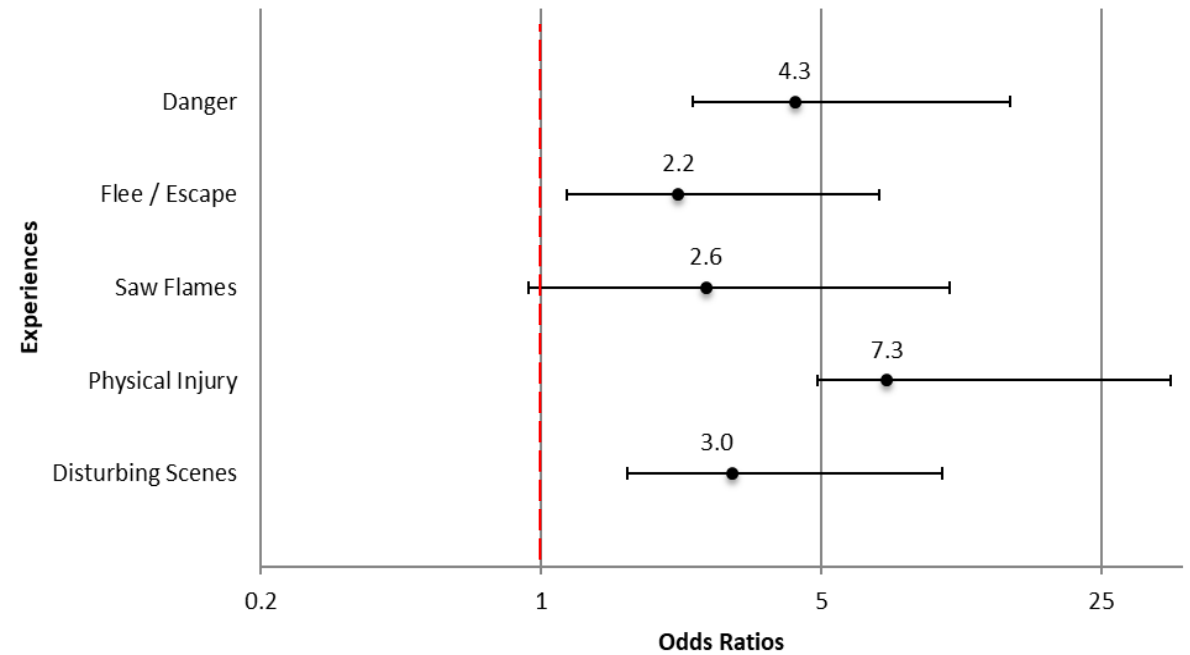


Results

Disaster Experiences and **Moderate Mental Illness**
(N=227)



Disaster Experiences and **Severe Mental Illness**
(N=195)



Conclusions

- Six years following the fertilizer plant explosion, community members report chronic and psychological distress associated with the explosion event, across experiences.
- The proportion of respondents who experience psychological distress is similar to other post-disaster populations.
- These findings suggest the chronic and mental health impacts a disaster has on a small rural community are long-term and must have long-term recovery efforts in place.

Conclusions

Recommendations by the Waco-McLennan County Public Health District

- Psychological first aid training for social workers and health professionals in the community (including clinical and public health).
- Accessible mental health services that include cognitive-behavioral therapy (CBT) for those that seek help.
- Accessible substance use disorder prevention programs made available or promoted locally that target alcohol and tobacco use.

References

- Bromet, E. J., Atwoli, L., Kawakami, N., Navarro-Mateu, F., Piotrowski, P., King, A. J., Aguilar-Gaxiola, S., Alonso, J., Bunting, B., Demyttenaere, K., Florescu, S., de Girolamo, G., Gluzman, S., Haro, J. M., de Jonge, P., Karam, E. G., Lee, S., Kovess-Masfety, V., Medina-Mora, M. E., Mneimneh, Z., Pennell, B. E., Posada-Villa, J., Salmeron, D., Takeshima, T., & Kessler, R. C. (2017). Post-traumatic stress disorder associated with natural and human-made disasters in the World Mental Health Surveys. *Psychological medicine*, 47(2), 227–241. <https://doi.org/10.1017/S0033291716002026>
- Goldman, E. & Galea, S. (2014). Mental health consequences of disasters. *Annual Review Public Health*, 35, 169-183. Retrieved from: <https://www.annualreviews.org/doi/pdf/10.1146/annurev-publhealth-032013-182435>
- Hansen, M., Andersen, T. E., Armour, C., Elklit, A., Palic, S., & Mackrill, T. (2010). PTSD-8: A Short PTSD Inventory. *Clinical practice and epidemiology in mental health : CP & EMH*, 6, 101–108. <https://doi.org/10.2174/1745017901006010101>
- Kessler, R. C., McLaughlin, K. A., Koenen, K. C., Petukhova, M., Hill, E. D., & WHO World Mental Health Survey Consortium (2012). The importance of secondary trauma exposure for post-disaster mental disorder. *Epidemiology and psychiatric sciences*, 21(1), 35–45. <https://doi.org/10.1017/s2045796011000758>
- Metzger, K., Akram, H., Feldt, B., Stone, K., Alvey, S., Henley, S., Hernandez, A., Melville, S., Haywood, T., & Zane, D. (2016). Epidemiologic Investigation of Injuries Associated With the 2013 Fertilizer Plant Explosion in West, Texas. *Disaster medicine and public health preparedness*, 10(4), 583–590. <https://doi.org/10.1017/dmp.2015.186>
- Neria, Y., Nandi, A., & Galea, S. (2008). Post-traumatic stress disorder following disasters: a systematic review. *Psychological medicine*, 38(4), 467–480. <https://doi.org/10.1017/S0033291707001353>

Questions?

Kahler Stone, DrPH, MPH
Assistant Professor
Public Health Program
Middle Tennessee State University
Kahler.Stone@mtsu.edu



Collaborative effort led by
Waco-McLennan County Public Health District