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Stakeholders' Consumption of Agricultural Injury Reports from News Media: A Six-Year Analysis of Website Usage and Visitor Analytics

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Abstract: AgInjuryNews.org is a news report-based, online sentinel surveillance dataset that has provided publicly available news and media reports of agricultural injuries since early 2015. In the 6 years since its inception, AgInjuryNews.org has hosted 12,897 unique visitors and has collected 997 user account registrations. New users from geographic areas home to NIOSH-funded agricultural research centres were most prominent, with these centres returning in larger numbers, comparatively. Users were acquired mostly through web searches, collaborations with other agencies, and paid Facebook.com advertisements. Paid advertisements recruited 3792 visitors; however, retention, registrations, and on-site engagement from this source was low. This analysis shows that data consumption on AgInjuryNews.org is steadily growing. Similar self-hosted programs that provide data or digital resources to agricultural safety and health stakeholders should consider the integration of auditing and analytics tracking, including user registrations.

Keywords: AgInjuryNews.org; usage; analytics; database; agriculture; safety; fatalities; injuries; news clipping; media; trauma

Citation: Burke, R.; Pilz, M.; Redmond, E.; Gorucu, S.; Weichelt, B. Stakeholders' Consumption of Agricultural Injury Reports from News Media: A Six-Year Analysis of Website Usage and Visitor Analytics. *Safety* **2021**, *7*, 48. https://doi.org/10.3390/safety7020048

Academic Editor: John McNamara

Received: 6 March 2021
Accepted: 11 June 2021
Published: 15 June 2021

1. Introduction

The Agriculture, Fishing and Forestry (AFF) industrial sector has the highest rate of fatalities across all occupations in the United States, reporting 22.8 fatalities per 100,000 workers as of 2017 [1]. AFF is the only known industry that allows active child labor (0–18 years of age) in a dangerous work zone. The youth occupational fatality rate in AFF is 28.21 per 100,000 FTE, compared to 0.63 per 100,000 FTE for all other industries, nearly 45 times higher [2]. The National Institute for Occupational Safety and Health (NIOSH) collected agricultural injury data until 2014; however, this was discontinued due to budget constraints [3]. Presently, there is a lack of reliable national surveillance data on agricultural injuries, and a growing concern of this gap has emerged in recent literature [4–8].

In partial response to the NIOSH survey discontinuation, the National Children's Center for Rural and Agricultural Health and Safety (NCCRAHS) developed and launched AgInjuryNews.org (AIN) on 27 January 2015, with the goal of tracking AFF injuries through sentinel news media surveillance [9,10]. Collections of publicly available news media reports have shown utility across sub-disciplines of agricultural safety and health, including: (1) building new emphases on improved coding systems [11]; (2) enhanced collaborative efforts with partners and government datasets [12]; and (3) exploring injuries in vulnerable, underrepresented populations, such as youth [13–15]. The AgInjuryNews system collects news media reports from news agencies across the United States and Canada and codes them based on multiple factors, including: injury agent, incident location, Farm and

Agricultural Injury Classification (FAIC) codes, victim demographics, and more [16]. At the time of this writing, the AIN system is the only known publicly available dataset of its kind.

Usage of health and injury databases can increase both scientific knowledge and population health. Electronic health records are common sources, generating hundreds of studies and significantly contributing to the scientific literature [17], and the usage of various health and safety databases can further inform and improve health outcomes [18,19]. This usage is integral to the capability and potential for the AIN system to positively impact agricultural injury, housing both injury surveillance data and evidence-based intervention and prevention strategies. With 6 years of data collection and dissemination via AIN, the purpose of this study was to provide a descriptive brief report of the users/stakeholders and their usage of the online system, in part spurred by usage of AIN in the US Bureau of Labor Statistics' (BLS) Census of Fatal Occupational Injuries (CFOI) [20]. This paper is a brief synopsis of several components of the system's analytics that we have chosen to describe in order to answer a core question: Who is consuming this type of data?

2. Materials and Methods

Website usage and tracking data were gathered from Google Analytics via their acquisition and audience tools. This included location of users, website engagement, user retention, pages/session, bounce rate (%), average session duration, and referral sources:

- User location: explored at both the city and census designated place levels. (Audience > Geo > Location)
- Website engagement: measured through length of time spent on the website and number of pages viewed. (Audience > Behavior > Engagement)
- Retention (%): determined through calculating the ratio of returning vs. new users to identify a percentage of users who returned to the website. (Audience > Behavior > New vs. Returning)
- Pages/session: number of webpages within the website that the user viewed in a single session. (Audience > Behavior > New vs. Returning)
- Bounce rate (%): the percentage of only a single page visit during a session [21] (Audience > Behavior > New vs. Returning)
- Average session duration (min): average duration of time the users spend on the webpage. (Audience > Behavior > New vs. Returning)
- Referral sources: website or channel through which users reached the website (Acquisition > All traffic > Source/medium)

The primary analysis in this paper focused on US users. Data were abstracted from Google Analytics via the data flow above. Descriptive statistics and frequency analyses were performed for relevant topics of interest following the filter selections to identify key user groups using Microsoft Excel. No inferential statistical tests were performed. Data ranged from 27 January 2015–27 January 2021. User account data was extracted from the database as of 27 January 2021. Only email addresses were used in this analysis. AgInjuryNews admin users were also included in this analysis.

3. Results

3.1. Visitor Locations

In the 6 years since its inception on 27 January 2015, AgInjuryNews.org has attracted 12,897 unique site visits, largely from the US (83.23%) (Table 1). Notable other countries included Canada, Germany, and the United Kingdom, which additively comprised an additional 8.01% (Table 1). Interestingly, 287 visitors (77%) from Germany were reported to be in the city of Saarbrücken. In 2020 alone, the site had visitors from 54 different countries.

Table 1. AIN usage by country.

Country	Users (%)
United States	10,734 (83.23)
Canada	404 (3.13)
Germany	372 (2.88)
United Kingdom	258 (2.00)
South Korea	232 (1.80)
China	129 (1.00)
Other	768 (5.95)
Total	12,897 (100)

Within the US, traffic to AgInjuryNews.org was split among major cities and regulatory bodies. Washington DC, including the Bureau of Labor Statistics, and Wausau-Rhinelander, Wisconsin, including the AIN admin team, hosted the largest and second largest number of visits, at 1313 (11.89%) and 853 (7.72%), respectively. Large metropolitan areas such as New York, NY and Chicago, IL made up the next most prevalent cities (Table 2). A total of 499 (4.52%) did not have any location set.

Table 2. AIN Usage by US Census Designated Place.

CDP	Users (%)
Washington, D.C. (Hagerstown, MD)	1313 (11.89)
Wausau-Rhinelander, WI	853 (7.72)
Not set	499 (4.52)
New York, NY	458 (4.15)
Chicago, IL	389 (3.52)
Minneapolis-St. Paul, MN	315 (2.85)
Other	6907 (64.34)
Total	10,734 (100)

3.2. Visitor Acquisition and Retention

Of the 10,734 US visitors, 1621 (11.11%) were returning visitors. Within metropolitan areas, Wausau-Rhinelander and Washington DC produced the highest number of returning users at 391 (24.12%) and 194 (11.91%), respectively.

Excluding locations with <20 returning visitors, the locations with the highest retention (ratio of returning visitors to new visitors) included mainly Midwest agricultural centers and affiliates of NCCRAHS (Figure 1). The areas with the lowest retention consisted mainly of large metropolitan areas with Dallas-Ft. Worth, TX only having an 8% retention rate.

Acquisition was primarily through direct visits to the site (54.8%) (Table 3). Social media comprised 31.4% of new users; however, bounce rate was high, at 95.67% and a low page/session and visit duration. Roughly 7.4% of visits were from organic searches (typing relevant search terms into a search engine and selecting a non-ad result).

Some acquisition sources of interest include CultivateSafety.org with 1.4% of total visits, the largest individual referral group. Compared to other sources, the University of Wisconsin–Stevens Point (UW-SP) resulted in the longest engagement upon visiting the site with 118 sessions; on average, each visit from UW-SP resulted in two future visits per visitor. This data point only includes those who visited the website through a direct link located on the UW-SP website.

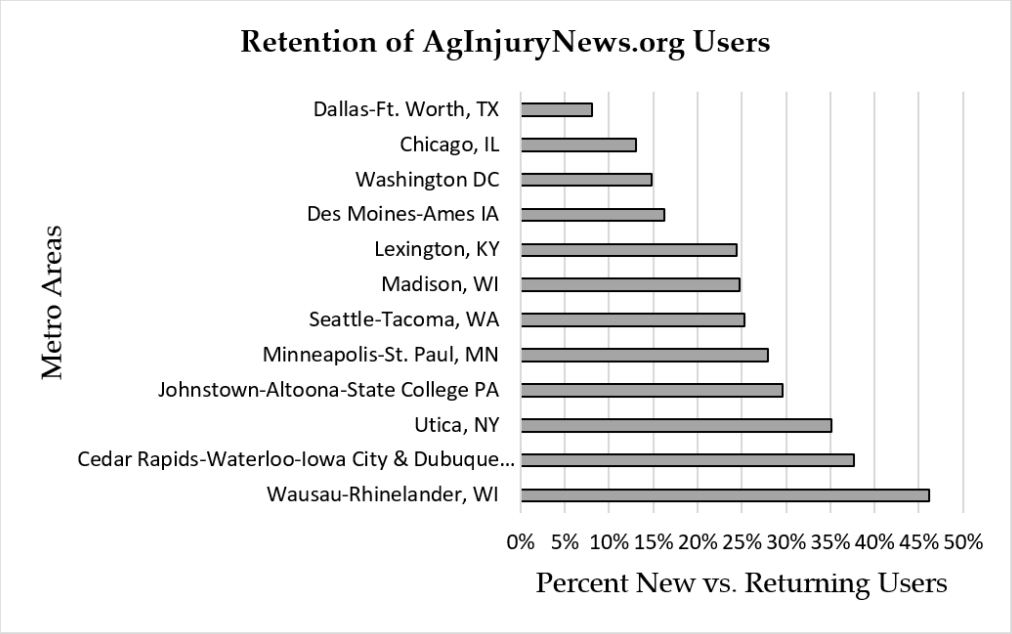

Figure 1. Retention of AgInjuryNews user by metro area.

Table 3. User acquisition sources and behavior during site sessions.

	Acquisition		Behavior		
Source	**New Users (%)**	**Sessions (%)**	**Bounce Rate %**	**Pages/Session**	**Avg. Duration (min:ss)**
Direct Access	7152 (54.8)	16,404 (51.7)	43.56	7.84	9:04
Social Media	4100 (31.4)	8687 (27.4)	95.67	1.37	0:21
Web Search	965 (7.4)	4190 (13.2)	32.89	11.31	13:08
Cultivatesafety.org	184 (1.4)	1067 (3.4)	44.52	6.9	6:30
UW-SP Referral	35 (0.3)	118 (0.4)	12.71	10.92	15:48
Other	611 (4.7)	1258 (4.0)	-	-	-
Total	13,047 * (100)	31,724 (100)	49.67	7.49	8:23

* Google Analytics double-counts some sessions that remain active past midnight.

3.3. User Affiliations

As of 27 January 2021, AgInjuryNews.org has 997 registered user accounts. Of these user accounts, the largest group (38.3%) was created using a .com top-level domain (TLD) (Table 4). Most of these emails consist of personal and work accounts, such as Gmail and Yahoo. Another substantial user base (28.1%) includes .edu email addresses, often affiliated with a university. Notably, 11.2% of users registered with a .gov email address, including 5.5% specifically registering with a BLS email address.

Table 4. User account email domains.

Top Level Domain	Users (%)
.com	382 (38.31)
.edu	280 (28.08)
.org	130 (13.04)
.gov	112 (11.23)
BLS.gov *	55 (5.52)
.US	27 (2.71)
Other	38 (3.81)

* BLS.Gov email addresses are also included in .gov counts.

4. Discussion

The user base of AgInjuryNews.org has grown steadily, presumably increasing awareness of available injury prevention materials and the prevalence of traumatic injuries in US AFF. With the lapse of consistent injury surveillance information from governmental agencies, AgInjuryNews seeks to help fill this gap. The BLS has adopted and internally promoted AgInjuryNews as a database to assist agents with the identification and validation of agricultural workplace fatalities in CFOI. News reports are one of the commonly used sources BLS agents analyze when verifying incomplete occupational fatalities [22]. Moreover, analyses of registered users' email addresses shows that 55 accounts from the BLS are registered in the system at the time of this writing, a strong indicator of the system's value to this government agency.

It should be noted that this study has several limitations. First, it is a brief description of the current and past usage of an agricultural injury dataset and did not include meaningful statistical analyses of changes over time. We intend to use this information to better gauge and direct the promotion and dissemination of AgInjuryNews.org to promote agricultural safety and health. This analysis also included AIN administrative accounts and users. These users are largely located in Marshfield, WI and spend a great deal of time on the website, inflating traffic from this geographic area. Data are also limited and poorly defined as much of the web traffic can be routed through various data centers or be masked using virtual private networks. For example, the high proportion of German visits being from Saarbrücken may be due to a Eurodata data centre and cloud service host located in the city; however the accuracy of this is unclear.

Traffic sources also varied and fluctuated across this time period. A large portion of social media traffic was likely due to a paid campaign undertaken on Facebook.com. This $300 campaign ran for two months in an effort to attract users outside of the AFF health and safety professional discipline. This campaign appeared to be an effective tool for attracting new visitors to the website; however, it was relatively ineffective in retaining these new visitors.

Examples of promotion include collaborating or engaging with universities or schools with large agriculture programs to conduct case studies of individual news accounts students found interesting, or summarizing and discussing injuries of a specific type or cause could also be notable avenues. Additionally, making it easier to initially access and view a dataset of news reports could increase user retention. Cookies on the website may be a fruitful way of still tracking those who do not create an account. A–B testing may be a logical option for comparing future referral avenues, providing multiple versions of AgInjuryNews.org to track the specific behaviour of users based on acquisition source [23]. Lastly, when searching for terms such as "farm injury" or "agriculture safety", AIN may be relatively low on the list of Google search results for most users. Nevertheless, there is some search result variability based on individual users' past search and web use history. Search engine optimization (SEO) is a valuable way to make a website more visible on these searches without having to pay repeatedly for various advertisements or attempting to connect with uninterested parties [24].

Most researchers likely want to know more about the consumers, the readers of their data and findings. Oftentimes, this information is readily accessible through peer-reviewed journals. In terms of scholarly scientific impact, one may also rely upon citations or other tracking systems such as Altmetrics [25]. With datasets, we are limited to the infrastructural parameters of the host. In the case of AgInjuryNews, our internal team developed the system, the auditing, and integrated the tracking code of Google Analytics [26]. Furthermore, we made the conscious decision early in the development to require user registration. We did this for one simple reason—we want to know more about the consumers of this type of data. Moreover, we want to be able to communicate with these stakeholders—the data consumers.

As we continue to expand the AgInjuryNews.org system and enhance data collection and quality, we will further explore innovative methods of dissemination that is effective

in recruiting and retaining users. The AgInjuryNews data collection and coding process and the online system were designed to provide value to external agricultural safety and health stakeholders, enabling and encouraging their efforts to reduce the burden of injury within the industry, domestically and abroad. Scalable, measurable, replicable methods will be particularly useful as we expand international data collection with collaborator groups such as the Canadian Agricultural Safety Association [27].

5. Conclusions

We identified key user groups using an online, sentinel-surveillance system of agricultural injuries, consisting of agricultural health and safety experts, analysts within the Bureau of Labor Statistics, educators, and various agricultural professionals. Users were prominently located in areas with research or governmental centers for agricultural health and safety and in large farming communities; however, traffic through data centers or other network routing likely impacted these findings. Paid advertisements were successful short term but saw little long-term gains in new user recruitment. Organic web searches and affiliate organizations such as CultivateSafety.org [28] and the Canadian Agricultural Safety Association have shown to be powerful tools to recruit new users.

We anticipate several new lines of research emanating from this small study, including further testing variations in AgInjuryNews.org, different recruitment and retention methods, including paid targeted advertisements (e.g., Facebook Ads Manager), and a deeper analysis of specific user flow and actions. For example, developing a deeper understanding of individual and organizational interests in these data, such as types of injuries journalists are searching for, or which email alert options are most appealing to agricultural employers. Research teams developing datasets, resource libraries, and similar publicly available systems should consider establishing a structured analytics regimen, beyond what we have reported here. The addition of user registration should also be considered. While many users will opt out, increasing the "bounce rate", those who do register are more likely to engage with the system and its content, and are presumably more interested in the data and related information as part of their profession. Finally, self-registration forms can collect contact information and user data that is useful, even crucial, to strengthening and broadening a team's stakeholder network.

Author Contributions: Conceptualization, R.B., B.W. and S.G.; methodology, R.B., M.P. and B.W.; formal analysis, R.B.; investigation, R.B. and B.W.; data curation, R.B. and M.P.; writing—original draft preparation, R.B., E.R., B.W. and S.G.; writing—review and editing, R.B., E.R., M.P. and B.W.; supervision, B.W.; funding acquisition, B.W. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by National Farm Medicine Center, the Marshfield Clinic Research Institute, the Agricultural Safety and Health Council of America (ASHCA), the Dean Emanuel Endowment, and the National Children's Center for Rural and Agricultural Health and Safety via the National Institute for Occupational Safety and Health (NIOSH; grant number 2 U54OH009568-11-00).

Data Availability Statement: The de-identified user data presented in this study are available on request from the corresponding author. The data are not publicly available due to address and contact information. Restrictions apply to the availability of the website usage data. Data was obtained from Google Analytics and AgInjuryNews.org and are available on request from the corresponding author.

Acknowledgments: The authors would like to thank the AgInjuryNews.org National Steering Committee for their continued guidance and support of the AgInjuryNews system. The authors also thank Marie Fleisner for her assistance with editing of the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

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