The Economic Impact of the Washington Township Fire Department

Bobby Frankfort
Ohio Wesleyan University
Community Research Fellow

The Community Research Fellows Program

This project was conducted by Bobby Frankfort under Ohio Wesleyan University's Community Research Fellows program. The program, launched by Ohio Wesleyan, gives students the opportunity to work on projects for local organizations, businesses, nonprofits, and government organizations in the community. Community Research Fellows are able to acquire real-world opportunities in hopes to become future leaders in the world. The program is administered by the University's Woltemade Center for Economics, Business and Entrepreneurship and was designed by Professor of Economics, Emeritus Robert Gitter, PhD. This project was supervised by Professor Gitter and Assistant Professor of Economics Will Georgic.

Executive Summary

The aim of this study is to quantify the economic impact of the Washington Township Fire Department (WTFD). Fire departments are essential to any community. While they do not generate direct revenue for local governments, the impacts of their services are felt throughout the community. A study such as this one helps to elucidate the return on investment of funding fire services. Our analysis is broken into three parts – The value of property saved from fire interventions, the value of life-years saved from responses to cardiorespiratory arrest events, and the city-wide output, employment, and earnings from WTFD's purchases and wages paid.

This study is modeled after multiple previous studies, including ones conducted in Phoenix, Arizona and another in Sherbrooke, Quebec. These two studies used regional input-output modeling to compute the respective fire department's impact on final demand output, earnings, and employment. Each study also used the Value of a Statistical Life (VSL) to estimate the economic effect of Cardiorespiratory Arrest interventions by the fire departments. Our study extends that aspect of the analysis by calculating the value of life-years saved (VLYS). Further information on estimating the VLYS was gathered from a 2020 study conducted at the Harvard T.H. Chan School of Public Health. Additionally, a study facilitated by our community research fellows' program in 2022 on the Delaware, Ohio fire department is referenced.

The WTFD responded to 65 fire incidents in 2022. From those incidents, the fire department saved property valued at an estimated $121,674,414, or 97.75% of the total value.

In 2022, WTFD had 20 responses for cardiac arrest. Of those 20, seven people were resuscitated and had a pulse when arriving at the hospital. Using the EPA's estimate for the VSL and dividing by the estimated life expectancy to calculate the VLYS, we estimate a value of $20,536,827.69 from the additional years of life due to these cardiac arrest responses of the WTFD.

Using the budget information from the department in 2022, we organized the expenditures into nine different categories. In total, the department spent an approximate $19.68 million. These categories were then paired with the corresponding RIMS-II county multipliers to calculate their impacts on final demand output, earnings and employment. However, Washington Township resides in three different counties: Franklin, Union, and Delaware counties. Therefore, three sets of RIMS-II multipliers were needed. The three sets of multipliers were then assigned weights based on population within each

county in the district. As Union County holds such a small percentage of the total population of Washington Township, it has been excluded from this section of the analysis.

The calculation of impacts on final demand output, earnings, and employment are thus the population weighted sums of the RIMS-II multipliers for Franklin and Delaware counties. The department's $19.68 million in spending resulted in an additional $22.7 million in final demand output, $4.9 million in earnings and created 115 additional jobs beyond WTFD employees.

Adding up the three approaches, the Washington Township Fire Department had an economic impact of $164,989,342.44 for the year 2022. In the same fiscal year, WTFD spent an estimated $19.68 million. Thus, the impact of the WTFD outweighs its expenditure by a factor of over eight to one. Comparing the economic impact to the total expenditures proves that the Washington Township Fire Department and its services are vital financial assets to the community.

Introduction

Washington Township has an estimated population of about 53,000[1] residents, spans 27.5 square miles and three counties (Franklin, Union, and Delaware) (Welcome to Washington Township). The city of Dublin, home to the PGA Memorial Tournament, is located within Washington Township.

To ensure the safety of all, the Washington Township Fire Department (WTFD) employs over one hundred firefighters across their four stations. Responding to over six thousand calls annually, the WTFD exemplifies how crucial fire stations can be to a community. Not only is the department responsible for fire prevention and suppression, but many of their responses are related to Emergency Medical Services. With the Department being funded by tax revenue, some may wonder about how their tax dollars are being spent.

In the fall of 2023, Ohio Wesleyan's Community Research Fellowship program partnered with the Washington Township Fire Department and Assistant Fire Chief John Donahue to quantify the economic impact of the fire department. This comes on the heels of a similar analysis of the City of Delaware's Fire Department performed in the fall of 2022 by Ohio Wesleyan alumnus Joseph DeRusso. This research is modeled after the Delaware study, as well as similar studies conducted in Sherbrooke, Quebec, and Phoenix, Arizona. The objectives of this study are to:

- Calculate the total property value saved as a result of fire interventions by the Washington Township Fire Department.
- Quantify the impacts on final demand output, earnings, and employment as a result of the fire department's expenditures.
- Determine the Value of Life-Years Saved from cardiac arrest responses by the Washington Township Fire Department.
- Sum these three components to estimate the total economic impact of the Washington Township Fire Department.

The value of life-years saved is very similar to VSL but is more precise in determining future impacts on the local economy. VLYS can be defined as the value assigned to the additional years of life gained because of a particular intervention or action. In this case, the intervention is the response of the WTFD. VLYS is calculated by taking the value of a statistical life and dividing it by life expectancy at birth

[1] Estimates of the population of Washington Township as well as the proportion in each county were provided by the Mid-Ohio Regional Planning Commission (MORPC)

for a specified population (77.7 years). In this study, we will be using the central estimate for VSL as given by the EPA ($11.01 million $2022). The calculated value for VLYS is then multiplied by the expectation of life at their given age, given by the 2006 life-expectancy table from the EPA.

Economic Impact Analysis – Methods Used

Value Saved from Fire Intervention

The largest contributor to the surrounding community for the Washington Township Fire Department is the value of property saved by fire interventions. Table A2 (see appendix) displays each fire incident that the WTFD responded to in 2022. Of the 65 total fire incidents that WTFD responded to, the fire department was able to save approximately 97.75% of the estimated value of the property and its contents, a total of $121,674,414.

Regional Input-Output Modeling System (RIMS-II)

The Regional Input-Output Modeling System (RIMS) is an economic tool created by the Bureau of Economic Analysis to calculate impacts of various projects in a certain region. This is done by assigning a multiplier to an industry based on its estimated impact. For example, a new road in a community is more likely to impact the asphalt and construction industry more than other industries. Further, the workers who built the road will spend a portion of their wages locally, thus impacting other industries as well.

The RIMS II multipliers consist of 372 different industries. Each multiplier is given a six-digit identifying code, followed by a description of the industry. One multiplier of note in this study is H00000 (Households). This allows us to see the impact of the fire department's wages on the surrounding community. As mentioned above, Washington Township is spread over three different counties (Franklin, Union, and Delaware). Because only about 8% of the residents reside in Union County, and because its county-level multipliers are less likely to be reflective of the economic activity in the region, Union County has been omitted from the analysis and only the multipliers for the other two counties were used. We weighed the impact by the relative populations of Franklin and Delaware Counties in the WTFD District.

Bill-of-Goods Approach

While the Washington Township Fire Department serves the community daily by employing residents and responding to fires and health emergencies, their impact reaches even further. Using the bill-of-goods approach, quantified the economic impact of the fire department's expenditures.[2] The expenditures of the WTFD were placed into seven categories. (See Table 1 below) with the majority of the spending going into wages, classified here as households.

Table 1: WTFD Expenditures grouped by Industry, before RIMS II Multipliers ($2022)

Industry & Code	Expenditures
23030A (Maintenance and Repair)	$1,956,562.26
339940 (Office supplies (except paper) manufacturing)	$64,669.82
447000 (Gasoline Stations)	$297,798.40
448000 (Clothing and clothing accessories stores)	$235,611.78
454000 (Non store Retailers)	$255,724.86
5419A0 (Miscellaneous professional, scientific, and technical services)	$989,896.84
H00000 (Households)	$15,881,229.31
Total	**$19,681,493.27**

The expenditures were grouped by industry and multiplied by their specific RIMS II multipliers for each county to estimate the effect of these expenditures on final demand output, earnings, and employment in the counties. Population was used to weigh the impact across the two sets of multipliers as economic activity relies on the number of people contributing to it. Tables A3 and A4 display the disaggregated estimated changes in final demand output, employment, and earnings for the two counties. In the employment column, the final total is the number of jobs created per $1 million of expenditure. Using a weighted average of the two county multipliers we see the estimated final total impact.

Table 2: Final Impacts on Output (Demand), Earnings, and Employment

Output ($2022)	Earnings ($2022)	Employment (Jobs)
$22,778,100.75	$4,973,752.09	115.43

[2] Rather than using a single multiplier in a direct input-output approach, the bill-of-goods method makes use of the RIMS II multipliers to estimate the effects on each industry. This can be conducted with regard to final economic demand, employment and earnings. One benefit of the bill-of-goods approach is that it accounts for the induced effects of changes in spending habits in households.

Overall, the expenditures of the Washington Township Fire Department resulted in an increase of over $22 million in final demand output, nearly $5 million in earnings, and 115 jobs outside of the Washington Township Fire Department workforce. This impact is a combination of the effects on Delaware and Franklin County, which directly impacts Washington Township.

Value of Life-Years Saved

The final portion of the analysis is calculating the impact of cardiorespiratory arrest (CRA) interventions by the WTFD. In 2022, the Washington Township Fire Department responded to 20 CRA events. Once transported to the hospital, 7 of the 20 survived. The goal of this section is to approximate the value gained from saving the lives of these seven people.

In prior studies, this value has been estimated by multiplying the number of lives saved by the estimated value of a statistical life, as given by the EPA. However, the data provided by the Washington Township Fire Department allows us to take it a step further. The data also contained the age of each individual, which allows us to calculate the value of life-years saved (VLYS). Using VLYS instead of VLS will provide a more accurate estimate, given that a person of 40 years old is likely to impact the economy more than someone in their seventies. The specific methodology used for calculating VLYS in this study was modeled after that used by the Harvard Center for Risk Analysis in a paper about the same topic (Hammitt).

The Value of Life Years Saved is calculated by taking the value of a statistical life and dividing it by life expectancy at birth in the same year that the VSL was calculated. In this study, the central estimate for VSL as given by the EPA (7.4 million $2006) was used, as was the life expectancy at birth in the same year (77.7 years). The calculated value for VLYS is then multiplied by the expected additional years of life at their given age.

For example, in 2022 the WTFD responded to a cardiac arrest for a 61-year-old male who was ultimately resuscitated, taken to a hospital, and discharged without impairment. Using the estimated life expectancy of 77.7 years, the value of a life year saved is the VSL estimate (adjusted for $2022) divided by the life expectancy. This calculation yields a value of $11.01 million ÷ 77.7 years = $141,779.96 per life year. For the case of the 61-year-old male, the WTFD saved an estimated 77.7 – 61 = 16.7 life years. Thus, the intervention of the WTFD yielded

16.7 × $141,779.96 = $2,367,725.39 on this specific response. Applying this process to each of the runs, Table 3 displays the total Value of Life-Years saved as a result of WTFD interventions. In 2022, the Washington Township Fire Department saved an estimated 144.85 life years, totaling a VLYS of $20,536,827.69 ($2022).

Table 3: VLYS Analysis (Values in $2022)

VSL (EPA)	VLYS	Life-Years Saved	Total
$11,016,303.15	$141,779.96	144.85	$20,536,827.69

Total Economic Impact

Table 4 estimates the total economic impact of the Washington Township Fire Department in 2022. The value is a sum of the three sections of analysis (fire intervention, bill of goods approach, and VLYS). Additionally, the WTFD created an estimated 115 jobs from their expenditures.

Table 4: Total Economic Impact of WTFD (Values in $2022)

Property Value Saved	$121,674,414.00
Final Demand Output Impact	$22,778,100.75
VLYS	$20,536,827.69
Total	**$164,989,342.44**

Conclusion

While the Washington Township Fire Department collects its revenue from tax dollars, this study demonstrates that these tax dollars are going a long way. WTFD has created a net local economic impact of nearly $140 million greater than its expenditures in 2022.

Most of the economic impact of the Department comes from fire intervention itself. The millions saved in both content and property value prove how important the WTFD is to the community. Additionally, their work during cardiorespiratory arrests provides significant value to the community. Saving an estimated 144 life-years each year is guaranteed to create more demand and jobs throughout Delaware and Franklin Counties, and as a result, Washington Township.

In short, the economic benefits of the Washington Township Fire Department greatly outweighed the costs of taxpayer dollars by a factor of over eight to one.

References

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Appendix

Table A1: RIMS II Multiplier for Delaware and Franklin Counties

Industry & Code	D Output (dollars)	D Earnings (dollars)	D Employment (jobs)	F Output (dollars)	F Earnings (dollars)	F Employment (jobs)
23030A (Maintenance and Repair)	1.4934	0.2225	4.0129	1.7268	0.3205	5.8621
339940 (Office supplies (except paper) manufacturing)	1	0	0	1	0	0
441000 (Motor Vehicle and parts dealers)	1.3833	0.2724	5.3553	1.6804	0.4593	8.2115
447000 (Gasoline Stations)	1.5075	0.2589	7.8024	1.8559	0.4453	11.7422
448000 (Clothing and clothing accessories stores)	1.592	0.2454	6.9069	1.9063	0.4015	10.8917
454000 (Non store Retailers)	1.3716	0.1875	6.8984	1.6142	0.3173	10.8459
491000 (Postal Service)	1.5101	0.3396	5.8562	1.8641	0.5319	8.9712
4B0000 (All other retail)	1.5131	0.3021	9.942	1.868	0.5073	15.56
517210 (Wireless telecommunications carriers (except satellite))	1.454	0.2083	4.353	1.7994	0.3043	6.0529
5419A0 (Miscellaneous professional, scientific, and technical services)	1.4301	0.3131	5.3378	1.6767	0.4222	7.2252
561300 (Employment Services)	1.5312	0.5228	15.8779	1.8485	0.6792	18.0957
H00000 (Households)	0.6931	0.1228	3.3647	1.0627	0.2411	5.8096

**** D denotes multipliers for Delaware County, F denotes multipliers for Franklin County**

Table A2 - WTFD Responses to Fire Incidents in 2022. Total value saved is highlighted at the bottom of the table.

Incident Number	Nature	Property Loss	Content Loss	Property Value	Content Values
22-0000023	Structure Fire	$0	$500	$22,197,117	$8,323,919
22-0000402	Construction or Demolition Landfill Fire	$0	$0	$210,100	$0
22-0000589	Cooking Fire Contained	$0	$125	$273,750	$205,312
22-0000595	Structure Fire	$0	$100	$427,476	$320,607
22-0000937	Structure Fire	$0	$15,000	$497,793	$373,344
22-0000965	Vehicle Fire	$5,000	$500	$5,000	$500
22-0001588	Structure Fire	$3,500	$0	$866,006	$649,505
22-0001748	Cooking Fire Contained	$0	$10	$593,096	$444,822
22-0001745	Vehicle Fire	$20,000	$500	$30,000	$501
22-0001796	Structure Fire	$113,425	$68,055	$288,419	$216,314
22-0001877	Mulch Fire	$5	$0	$5	$0

Incident Number	Nature	Property Loss	Content Loss	Property Value	Content Values
22-0001873	Outside Equipment Fire	$5,000	$0	$6,000	$0
22-0001911	Dumpster Fire	$25	$0	$25	$0
22-0001974	Road freight r transport vehicle	$500	$0	$115,000	$50,000
22-0002127	Cooking Fire Contained	$0	$1,000	$336,549	$252,412
22-0002169	Mulch Fire	$5	$0	$5	$0
22-0002245	Cooking Fire Contained	$0	$25	$1,503,601	$1,127,700
22-0002487	Structure Fire	$1,500,000	$300,000	$572,474	$429,355
22-0002513	Vehicle Fire	$2,000	$200	$3,000	$1,000
22-0002767	Mulch Fire	$5	$0	$5	$0
22-0003031	Structure Fire	$1,000	$0	$2,230,682	$1,673,001
22-0003036	Cooking Fire Contained	$250	$50	$474,273	$355,705
22-0003167	Mulch Fire	$5	$0	$5	$0
22-0003295	Cooking Fire Contained	$0	$25	$25,000	$12,500
22-0003398	Mulch Fire	$5	$0	$5	$0
22-0003464	Shed Fire	$2,400	$0	$2,400	$0
22-0003471	Mulch Fire	$5	$0	$5	$0
22-0003486	Shed Fire	$500	$200	$500	$200
22-0003487	Rubbish Fire	$25	$0	$25	$0
22-0003498	Mulch Fire	$5	$0	$5	$0
22-0003489	Mulch Fire	$5	$0	$5	$0
22-0003517	Structure Fire	$198,000	$186,000	$495,368	$371,526
22-0003563	Cooking Fire Contained	$0	$25	$8,695,276	$6,521,457
22-0003627	Dumpster Fire	$500	$0	$500	$0
22-0003665	Mulch Fire	$5	$0	$5	$0
22-0003739	Rubbish Fire	$50	$0	$50	$0
22-0003939	Mulch Fire	$5	$0	$5	$0
22-0004063	Road freight r transport vehicle	$2,500	$0	$255,000	$0
22-0004180	Structure Fire	$19,252	$21,658	$7,816,610	$5,862,458
22-0004227	Vehicle Fire	$500	$0	$25,000	$1,000
22-0004285	Rubbish Fire	$15	$0	$15	$0
22-0004334	Structure Fire	$0	$500	$334,267	$250,700
22-0004473	Road freight r transport vehicle	$1,000	$0	$115,000	$50,000
22-0004546	Outside Equipment Fire	$1,300	$0	$1,300	$0
22-0004537	Mulch Fire	$5	$0	$5	$0
22-0004531	Bus Fire	$1,000	$0	$20,000	$1,000
22-0004642	Mulch Fire	$5	$0	$5	$0
22-0004777	Cooking Fire Contained	$0	$25	$2,230,682	$1,673,001
22-0004934	Vehicle Fire	$500	$200	$15,000	$1,000
22-0004995	Mulch Fire	$5	$0	$5	$0
22-0005104	Structure Fire	$94,345	$141,518	$314,485	$235,863
22-0005564	Mulch Fire	$5	$0	$5	$0
22-0005674	Mulch Fire	$5	$0	$5	$0
22-0005652	Tree Fire	$1,000	$0	$1,000	$0
22-0005682	Cooking Fire Contained	$0	$25	$416,322	$312,242
22-0005764	Cooking Fire Contained	$0	$25	$22,527,429	$17,195,571
22-0005768	Mulch Fire	$5	$0	$5	$0
22-0005979	Mulch Fire	$5	$0	$5	$0
22-0006047	Vehicle Fire	$8,000	$8,000	$0	$0
22-0006090	Mulch Fire	$5	$0	$5	$0
22-0006164	Rubbish Fire	$5	$0	$5	$0
22-0006315	Vehicle Fire	$5,000	$500	$9,796	$500
22-0006380	Structure Fire	$1,000	$1,000	$468,696	$351,522
22-0006435	Vehicle Fire	$6,000	$0	$6,000	$0
22-0006561	131	$3,700	$0	$3,700	$0
		$1,997,382	$745,766	$74,409,877	$47,264,537
		$2,743,148	**$121,674,414**		

Property Saved	**97.746%**

Table A3: Total Impacts of Expenditures After Multipliers (Delaware County)

Industry & Code	Output (dollars)	Earnings (dollars)	Employment (jobs)
23030A (Maintenance and Repair)	2,921,930.08	435,335.10	7851488.69
339940 (Office supplies (except paper) manufacturing)	64,669.82	-	0.00
441000 (Motor Vehicle and parts dealers)	-	-	0.00
447000 (Gasoline Stations)	448,931.09	77,100.01	2323542.24
448000 (Clothing and clothing accessories stores)	375,093.95	57,819.13	1627347.00
454000 (Non store Retailers)	350,752.22	47,948.41	1764092.37
5419A0 (Miscellaneous professional, scientific, and technical services)	1,415,651.47	309,936.70	5283871.35
H00000 (Households)	11,007,280.03	1,950,214.96	53435572.26
Total	**$ 16,584,308.66**	**$ 2,878,354.31**	**72.29**

*** Each entry in the Output Column represents the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.**

*** Each entry in the Employment column represents the total change in number of jobs that occurs in all industries for each additional 1 million dollars of output delivered to final demand by the industry corresponding to the entry. Therefore, in order to get the accurate employment impact (jobs created, the total impact on employment was divided by 1 million.**

Table A4: Total Impacts of Expenditures After Multipliers (Franklin County)

Industry & Code	Output (dollars)	Earnings (dollars)	Employment (jobs)
23030A (Maintenance and Repair)	3,378,591.71	627,078.20	11469563.62
339940 (Office supplies (except paper) manufacturing)	64,669.82	-	0.00
447000 (Gasoline Stations)	552,684.05	132,609.63	3496808.37
448000 (Clothing and clothing accessories stores)	449,146.74	94,598.13	2566212.82
454000 (Non store Retailers)	412,791.07	81,141.50	2773566.26
5419A0 (Miscellaneous professional, scientific, and technical services)	1,659,760.03	417,934.45	7152202.65
561300 (Employment Services)	-	-	0.00
H00000 (Households)	16,876,982.39	3,828,964.39	92263589.80
Total	**$ 23,394,625.81**	**$ 5,182,326.29**	**119.72**

*** Each entry in the Output Column represents the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.**

*** Each entry in the Employment column represents the total change in number of jobs that occurs in all industries for each additional 1 million dollars of output delivered to final demand by the industry corresponding to the entry. Therefore, in order to get the accurate employment impact (jobs created), the total impact on employment was divided by 1 million.**