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Analysis of Factors Influencing the Spread of Asian Swine Fever (ASF) Disease in Samosir District, North Sumatera Province

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Abstract. In Samosir, socio-cultural elements are closely related to pig farming and traditional wisdom which makes pig farming an important part of traditional ceremonies for Christians. In 2019 to 2020 ASF disease is spreading on Samosir Island. *African Swine Fever* (ASF) is a highly contagious viral disease of pigs, causing various internal bleeding and accompanied by a very high mortality rate. This study used a survey method (interviews) and data analysis using multiple linear regression analysis to obtain the factors that influence the cause of the spread of Asian Swine Fever (ASF) in pigs in Samosir Regency. Based on the results of the study it was found that there was a significant effect of the vaccination variable, the biosecurity variable and the livestock transportation variable, while the variables that had no significant effect were the feed variable and the cage variable on the spread of Asian Swine Fever (ASF) in pigs in Samosir Regency.

Keyword: African Swine Fever, Contagious, Mortality, Pig, Vaccination

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1. Introduction

Pigs are one type of animal that has the potential to be improved to fulfill the demand for meat. One of the of the various possible livestock products to be produced is the demand for swine commodities [1]. In North Sumatra alone, especially in Samosir district, the population of pigs reaches 30,309 pigs with meat production of 189,500 tonsSocio-cultural factors that are intricately linked to pig farming, together with traditional knowledge that renders pig farming a significant component of traditional rituals and practices among adherents of the Christian faith [2]. The presence of diseases, whether infectious or non-infectious, constitutes a significant hindrance to successful pig production. Pigs are prone to several diseases that are induced by viral, bacterial, and parasite pathogens. African Swine Fever (ASF) has been identified as a viral virus that has been attributed to the substantial mortality of pigs in Samosir Regency. African Swine Fever (ASF) is a viral disease characterized by its high transmissibility among swine herds, leading to internal bleeding and a markedly increased mortality rate. The user presented a numerical citation [3]. The introduction of Asian Swine Fever (ASF) into Indonesia was

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influenced by various causes, as indicated by a risk analysis research. The elements considered in this study include the importation of pork and its associated products, vestiges of international transit by sea and air routes, persons acting as carriers of the virus, and the potential for contact between pigs and their immediate environment. The ASF virus has a notable level of adaptability towards many environmental variables. The substance exhibits remarkable stability throughout a broad pH spectrum ranging from 4 to 13, so enabling its resilience in both acidic and alkaline environments. Moreover, it has been shown that this particular virus exhibits the capacity to endure in blood samples at a temperature of 40 degrees Celsius for a period of 18 months. The ASF virus has the ability to remain viable for a duration of up to 15 weeks in the case of cold meat, whilst frozen meat can serve as a reservoir for the virus for several years. Furthermore, it has been observed that ham has the ability to maintain the presence of the virus for a duration of six months. As per the reference provided [4], the individual was kept within a pig enclosure for a period of one month. Prevention is an essential and imperative measure. The adoption of biosecurity protocols can function as a preventive strategy [5]. Therefore, after analyzing the discourse around the mechanism of propagation and the potential factors influencing the spread of Asian Swine Fever (ASF) described previously, it is hypothesized that the factors contributing to the transmission of the disease are: the control of African Swine Fever (ASF) in pigs in Samosir Regency involves a range of tactics, including the employment of vaccines, the adoption of biosecurity measures, the regulation of animal transportation, the provision of high-quality feed, and the proper utilization of cages. The primary aim of this research was to examine factors that contribute to the spread of Asian Swine Fever (ASF) in Samosir Regency.

2. Materials and Methods

The study was carried out in Samosir Regency, located in the North Sumatra Province. The specified time period is from October to December of 2022.

2.1 Method of collecting data

This study employed a survey methodology, incorporating interviews and data analysis through multiple linear regression analysis, in order to identify the factors that contribute to the transmission of Asian Swine Fever (ASF) among pigs in Samosir Regency.

2.2.1. Operational definition

The operational definition is a research element that tells how to measure a variable, in other words the operational definition is a kind of implementation guide on how to measure a variable [6].

2.2.2. Data collection technique

Data is acquired through the process of observation and conducting interviews. Observation is a systematic strategy and technique employed to gather data by carefully observing and documenting the symptoms or occurrences present within the subject of study. The interview is a

systematic process of data collection that involves the use of questions and answers, and is conducted in accordance with research objectives

Table 1. Number of Samples of Breeders by District

No.	Subdistrict	Breeder Sample (people)
1	Pangururan	18
2	Ronggurnihuta	0
3	Simanindo	3
4	Daily	6
5	Sianjur Mulamula	5
6	Palipi	6
7	Sitiotio	3
8	Nainggolan	7
9	Onan Runggu	4
	Total	52

2.2.2. Research variable

The dependent variable is the variable that is influenced or modified by variations in the independent variable. The focal point of investigation in this research is Asian Swine Fever (ASF), which is designated as the dependent variable (Y1). Independent variables are factors that are postulated to exert an autonomous influence on the dependent variable. The present study examines the independent variables of Biosecurity (X1), Livestock Transportation (X2), Feed (X3), and Cages (X4).

2.2.3. Data analysis technique

In the process of conducting multiple linear regression analysis, data is reviewed using the Best Linear Unbiased Estimator (BLUE) guidelines.

3. Results and Discussion

Table 2. Kolmogorov-Smirnov Test Results

No.	**Test**	**Sig.**
1.	*Kolmogorov-Smirnov*	0, 200[c,d]

The estimated value of the Kolmogorov-Smirnov test statistic is 0.200, which exceeds the predetermined significance level of 0.05. This finding suggests that the available evidence is not strong enough to support the rejection of the null hypothesis, indicating that there is no statistically significant disparity between the distribution of residuals and a normal distribution.

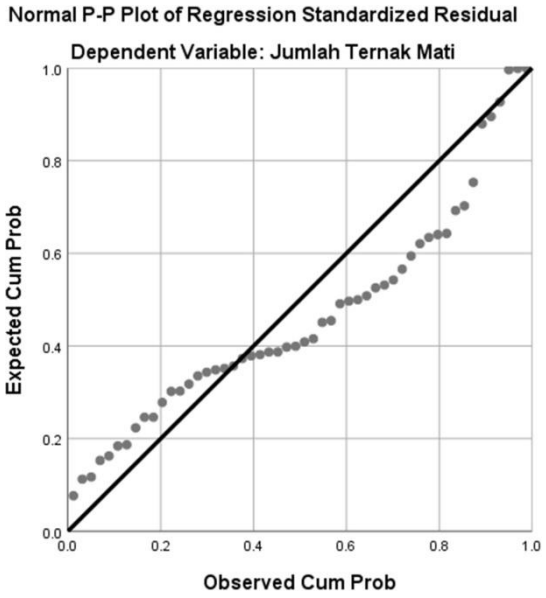

Figure 1. Graph of Normality *Probability Plot*

Therefore, it can be inferred that the residual model data conforms to a normal distribution. On figure 1, it can be seen that plot points that follow line diagonal scattered around theline. This means that the data is normally distributed and fulfil normality assumption.

Table 3. Table of Multicollinearity Test Results

No.	Dependent Variables	tolerance	VIF
1.	Biosecurity	0.692	1.445
2.	Livestock Transportation	0.670	1,492
3.	Feed	0.603	1,657
4.	Pen	0.677	1,477

Table 3 demonstrates that the tolerance values of all variables in the regression model exceed 0.10, but the variance inflation factor (VIF) remains below 10. This suggests that there is a presence of multicollinearity in the linear regression model on the study of symptoms, despite the absence of any prior experience.

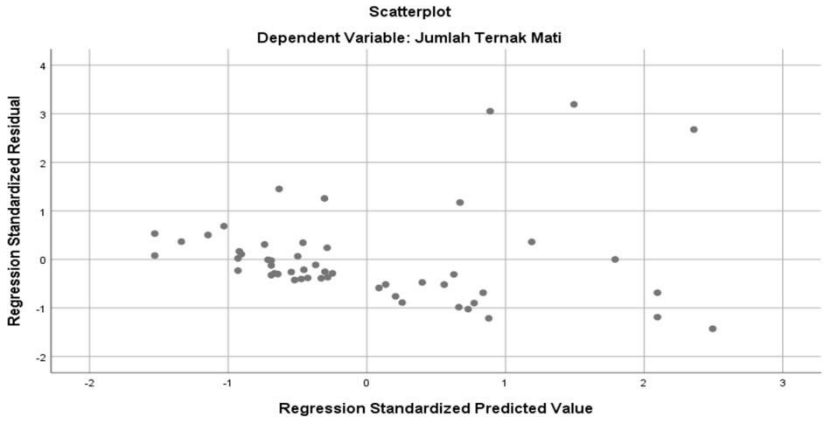

Figure 2. Scatterplot graphic

According to the observations made in Figure 2, it is evident that the data points exhibit a random distribution, lacking any discernible pattern. The visual representation indicates the absence of heteroscedasticity in the regression model.

Table 4. The results of the Coefficient of Determination of Multiple Linear Regression

Model	R	R Square	Adjusted R Square	Std. Error of the estimate
1	,839 [a]	,704	,672	12,79710

The value of the coefficient of determination is 0.704. The findings of the research indicate that a substantial portion, specifically 70.4%, of the variable under investigation, which pertains to the dissemination of African Swine Fever (ASF) disease, may be attributed to a set of independent variables including vaccines, biosecurity measures, animal transportation, feed, and cages. Approximately 29.6% of the remaining component is subject to the influence of factors that have not yet been integrated into the current model.

Table 5. Multiple linear regression

Model	Unstandarized Coefficients		Standarized Coefficients	T	Sig.
	B	Std.Error	Beta		
(Constant)	21.862	24.693			,381
Biosecurity	3.963	0.679	0.563	5.835	0,000
Transportation	7.702	2.691	0.281	2.863	0,006
Swill Feeding	0.561	1.209	-0.048	0.464	0,645
Pig Pens	-0.351	1.473	-0.023	-0.238	0,813

3.1. Biosecurity

Based on the research data, the regression coefficient is theoretically determined to be 3.963. This discovery provides evidence that increasing the biosecurity variable will lead to a decrease of 3.963 in the transmission rate of Asian Swine Fever (ASF) among pigs. The present discovery provides evidence that the biosecurity factor plays a substantial role in the spread of Asian Swine Fever (ASF) among the pig population of Samosir Regency. Based on empirical findings, it has been shown that breeders often engage in farm-to-farm mobility without strictly following to stringent biosecurity protocols, including the practice of cleaning themselves and their immediate environment prior to and subsequent to departing the premises [7,8]. This discovery is consistent with the claim made in citation [9] that there is a correlation between breeders in the agricultural setting, which may potentially facilitate the spread of African Swine Fever (ASF).

3.2 Livestock Transportation

Based on the findings of the research, it can be theoretically inferred that the estimated value of the regression coefficient is 7.702. This finding demonstrates that augmenting the variable of livestock transportation will result in a reduction of 7.702 in the transmission rate of Asian Swine Fever (ASF) among pigs. This finding demonstrates that the variable of livestock transportation significantly influences the transmission of Asian Swine Fever (ASF) among pigs in Samosir Regency. Small-scale farmers frequently engage in the sale or direct slaughter of pigs without conducting prior health assessments, hence impeding the monitoring of pig movement between various sites or regions [10]. Based on empirical data obtained through interviews conducted with farmers, it is evident that the general public possesses awareness regarding the hazards associated with African Swine Fever (ASF) as a zoonotic illness. This assertion is substantiated by the findings presented in reference [11], which demonstrate that the most efficient means of African Swine Fever (ASF) transmission is through direct contact with infected pigs.

3.3 Swill Feeding

Based on Table 5 shows that increasing the feed variable will increase the spread of *Asian Swine Fever* (ASF) by 0.561. This shows that the feed variable has no effect real on the spread of *Asian Swine Fever (ASF)* in Samosir Regency. The success of pig production and reproduction is contingent upon the sufficiency of feed, encompassing both its quality and quantity. Transmission occurs through direct contact with infected animal body fluids, including saliva, respiratory secretions, urine, and feces. Additionally, indirect contact can occur by exposure to fomites or other objects that have been contaminated with the African Swine Fever (ASF) virus. This includes instances such as swill feeding from airplanes and restaurants. The presence of pork tainted with the African Swine Fever (ASF) virus has been documented [12]. Surveillance conducted in the highlands of Tanzania, Russia, and Europe explained that based on exploratory participatory epidemiology, one of the risk factors for ASF is the lack of biosecurity and the use of swill feeding [13]. the feed used by breeders consists of concentrate and agricultural waste,

while for leftover food or use of swill feeding not many breeders there provide it asthe main feed on their pig farms, so that the feed factor is not included or has no effect on the spread of Asian Swine *Fever* (ASF) that I got in the field. [14] that the type of feed that is often given to pigs is from agricultural waste such as cassava, banana stems, taro, papaya leaves, cassava leaves, coconut dregs.

3.4 Pig Pen

The research findings indicate that, in theory, the estimated regression coefficient is -0.351. This finding demonstrates that augmenting the stable variable will result in a decrease in the transmission rate of Asian Swine Fever in pigs by a magnitude of 0.351. This finding indicates that the variable of cage conditions does not have a significant impact on pork output in Samosir. The study findings indicate that the presence of pens in pig farms located in Samosir does not exert a statistically significant influence on the transmission of Asian Swine Fever (ASF) among pigs. This is attributed to the fact that certain pig breeders in Samosir have demonstrated attentiveness towards ensuring the comfort and cleanliness of their enclosures, as well as maintaining the hygiene of the equipment within their respective pens. Consistently, this aligns with the assertion that ASF contamination can arise from various sources such as flooring, equipment, and vehicles [14].

4. Conclusion

There exists a notable correlation among Vaccination, Biosecurity, Livestock Transportation, Feed, and Cages in relation to the transmission of Asian Swine Fever (ASF) among pigs in Samosir Regency. The factors that exert a substantial influence on the transmission of Asian Swine Fever (ASF) among pigs in Samosir Regency include vaccination, biosecurity measures, and livestock transportation. The variables of feed and housing have been determined to have no statistically significant impact on the transmission of Asian Swine Fever (ASF) among pigs in Samosir Regency.

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