Comparing mosquito larvae in Chinese-Thai and Indian-Thai communities in Bangkok commercial districts using GLOBE Observer: Habitat mapping App

Students: Saknarin Srima, Tinnapat Sittisuwan, Nattapol Yurung, Akaruch Duangbubpha, Yuth Kanjanaprayut, Rujipong Paesuae, Jirachaya Muengpradit, Saran Laiwisetkun, Watsiri Taloompook, Natthaphum Natthakul, Pichapat Pongpattanakom, Siwakorn Saitawee, Siwakorn Phanichpichetwong, Warinya Nithichaipakul, Chanya Sirisin, Siriyakorn Dusadekulchai, Poonnawit Wongprateepwilai, Supanat Thanapornpoth, Poonyanuch Chawalchotewut, Inthanon Ratnawardhana, Chotika Lomwong, Penrung Kumpang, Thunyarat Suksuwan, Yanisa Kanjanawikut, Kittiput Liemwittayanon, Patcharapat Kasibut

School: Samsenwittayalai
Teacher: Mrs. Kornkamon Kumnerdkarn
Email: rat.kornkamon@gmail.com

Abstract

Yaowarat Chinatown, Chinese-Thai commercial district and Pahurat, Indian-Thai commercial district are communities that are popular tourist attractions. Tree pots and lotus basins are used to decorate the sites, and they are also water containers that can be mosquito breeding sites. The research team was interested in exploring mosquito larvae information in these two communities. This study investigates (1) the numbers of mosquito larvae found in Chinese-Thai and Indian-Thai communities, (2) the differences between the number of mosquito larvae found in Chinese-Thai and Indian-Thai communities, and (3) the differences between house index and container index in Chinese-Thai and Indian-Thai communities. GLOBE Observer Mosquito Mapping App was used to collect the picture, number, and species of mosquito larvae in the containers. Descriptive statistics were used to describe the number of mosquito larvae found in each community. T-test independent was conducted to compare the mean mosquito larvae found. Container index was calculated to show and compare the percentage of water-holding containers infested with larvae or pupae. The results were that 3 *Ae. aegypti*, 3 *Ae. albopictus*, and 1 *Culex spp.* larvae were found in 49 containers in Chinese-Thai community and 47 *Ae. aegypti*, 5 *Ae. albopictus*, 3 *Culex spp.*, and 3 *Anopheles spp.* larvae were found in Indian-Thai community. T-test independent showed that there was no significant difference between the number of mosquito larvae in the two communities. Container indexes of *Ae. aegypti*, *Ae. albopictus*, *Culex spp.*, and *Anopheles spp.* in Indian-Thai were more than those in Chinese-Thai communities. To conclude, the affected mosquito larvae containers in Indian-Thai community were more than those in Chinese-Thai, considering their container index. Studies in more samples of containers and analyzing data of only containers with mosquito larvae may improve the research.

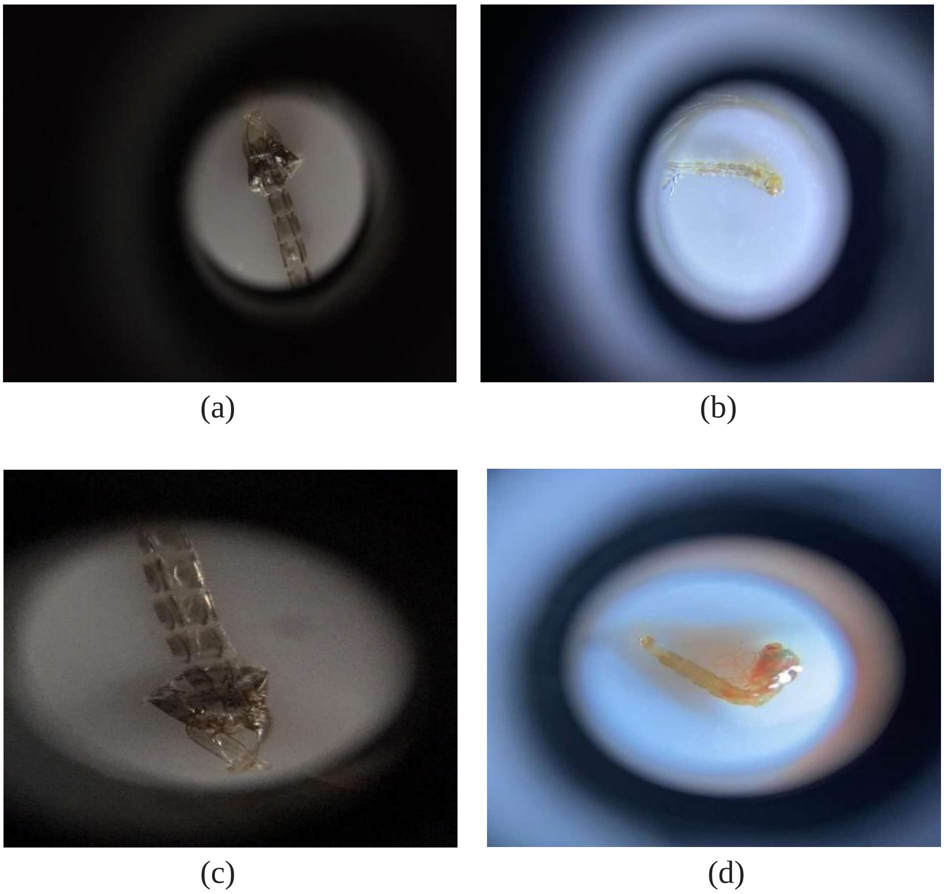

Figure 1 Show the species of the mosquitoes. (a) *Ae. aegypti*, (b)*Anopheles spp.*, (c) *Ae. albopictus*, (d) *Culex spp.*

Keywords: Mosquito larvae, *Aedes* species, *Culex* species, container index, Chinese-Thai community, Indian-Thai community

Research Questions

1. What are the numbers of mosquito larvae found in Chinese-Thai and Indian-Thai communities?
2. What are the differences between the number of mosquito larvae found in Chinese-Thai and Indian-Thai communities?
3. Are there any differences between container indexes in Chinese-Thai and Indian-Thai communities?

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Introduction and Review of Literature

Dengue fever is caused by dengue viruses of the family Flaviviridae, transmitted principally by Aedes aegypti, and Ae. albopictus, in the tropical and subtropical regions of the world (Hasan et al., 2016) According to WHO, 70% of DENGUE infected were from Western Pacific and Southeast Asia. So that we did some research on mosquitoes in Chinese-Thai and Indian-Thai communities in Bangkok (Yaowarat and Pahurat) to prove that WHO research is reliable. Dengue becomes a global threat and spreads its authority in the city and countryside with the tropical and subtropical climates in many countries. Accurate mapping of the spatial distribution of mosquito breeding habitats is not essential for the cost-effective deployment because. Aedes mosquitoes are the main cause disease vector and transmitter of dengue fever, Zika, and Chikungunya. In Central Thailand, the primary vector species is *Ae. aegypti* (Servadio et al, 2017).

Mosquito control is a critical component of the Arbovirus control programs, and one of the most effective ways to control a population of mosquitoes is to reduce its breeding chance and habitats. Classical survey techniques of larval habitats, achieve small spatial coverage, limiting research on Aedes breeding sites. WHO (2009) proposed some indicators for larval survey, which one is called Container index (CI) – i.e. percentage of water-holding containers infested with larvae or pupae.

$$CI = \frac{Container\ Positive}{Numbers\ of\ containers\ inspected} \times 100$$

Geospatial mapping by using GLOBE Observer application offers the potential to identify larval habitats on a small area basis to a degree that is not difficult or possible using conventional ground surveys.

Mosquitoes resort to a wide variety of larval habitat types. Artificial containers are a major source of breeding habitats for mosquitoes worldwide. These artificial containers include a big water jar, plastic bottle, car tires, old sink, broken bathtub, or anything that can cause the waterlogged. There are several examples of how each mosquito species prefers different breeding sites. Ae. aegypti breeds in a wide assortment of domestic containers, whereas Ae. albopictus tends to be found in natural containers, such as the clump of grass and oyster shells, or in artificial containers outside the houses such as big water jars, plastic bottles and car tires (Vezzani, 2007). A Chinese-Thai and Indian-Thai community in

Bangkok (Yaowarat) is one of the most tourist attraction places in Thailand where mosquito breeding sites could be affected by tourism. The objectives of this study are to investigate:

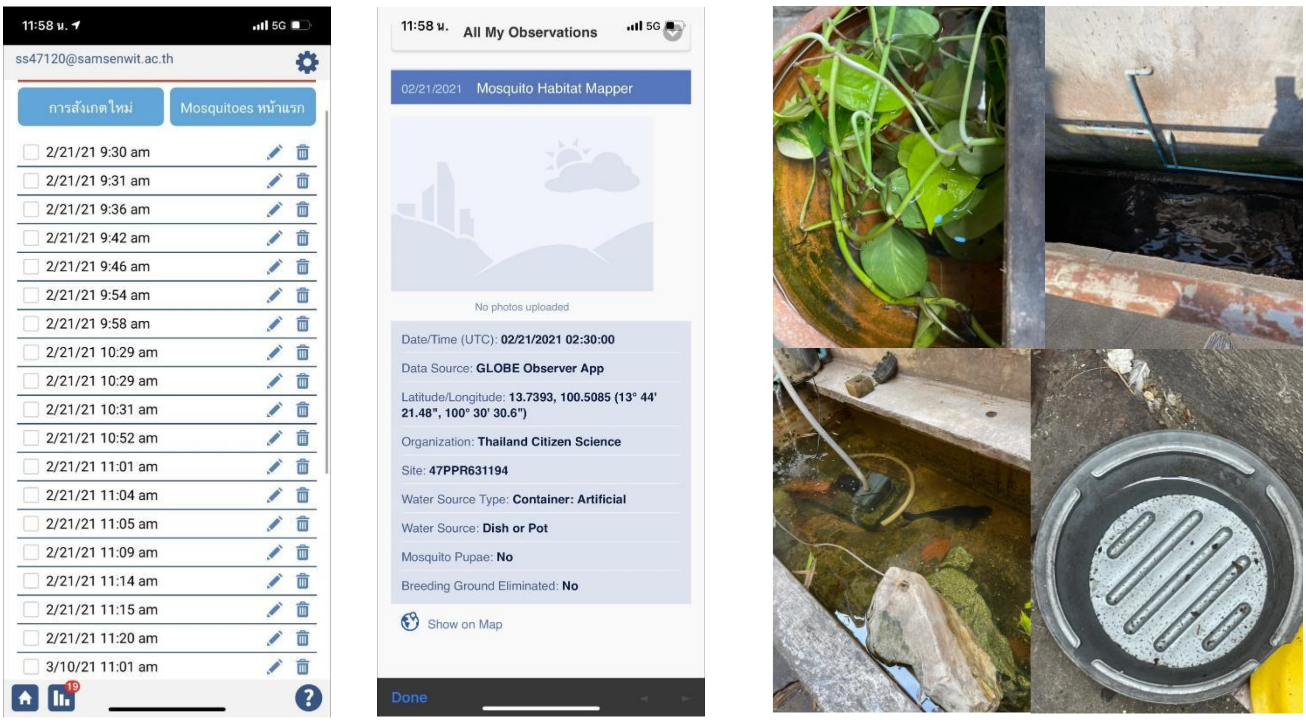
1. The numbers of mosquito larvae found in Chinese-Thai and Indian-Thai communities
2. The differences between the number of mosquito larvae found in Chinese-Thai and Indian-Thai communities
3. The differences between container index in Chinese-Thai and Indian-Thai communities.

Operational Definitions

1. Chinese-Thai communities in Bangkok are the communities in the commercial district in Chinatown Yaowarat, Bangkok.
2. Indian-Thai communities in Bangkok are the communities in the commercial district in Pahurat, Bangkok.

Data Collection

Mosquito larval survey was conducted in Yaowarat and Pahurat, Chinese community in Bangkok. Yaowarat is located at 13° 44' 28.09" N latitude and 100° 30' 29.90" E longitude. And Pahurat is located at 13° 44' 41.45" N latitude and 100° 30' 2.24" E longitude in February 2021. We studied two communities: Yaowarat Chinese community and Pahurat Chinese community. 49 containers in Chinese-Thai communities and 44 containers in Indian-Thai communities.



(a) **(b)** **(c)**

Figure 2 Show Our Mosquito Habitat Observations summary in GLOBE Observer (a) Our Observation (b) Our Observation and (c) Examples of data in the form of pictures on the day the actual data was collected.

Entomological Studies

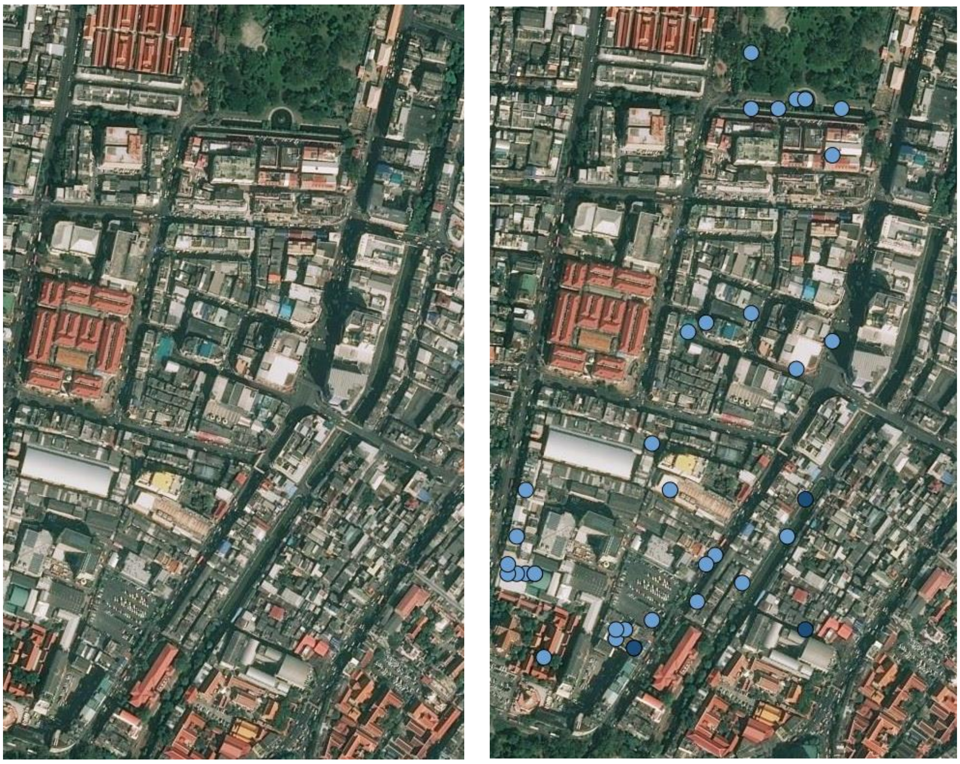
We collected all mosquito larvae from outdoor containers using GLOBE Observer: Mosquito Habitat Mapper App (GO MHM). We collected water pH and water temperature of each water container using the GLOBE Atmosphere protocols. We collected mosquito larvae from each outside and outside (natural and artificial) water container by using fishnets with 0.55 mm mesh size nets. All mosquito larvae from each water container were placed in a plastic bag and tied the bag with a rubber band.

Data Analysis

1. Find the frequency of mosquito larvae found in Chinese-Thai and Indian-Thai communities.
2. Use t-test independent to compare the differences in the number of larvae found in Chinese-Thai and Indian-Thai communities using SPSS Program Version 22.
3. Calculate the container index in Chinese-Thai and Indian-Thai communities.

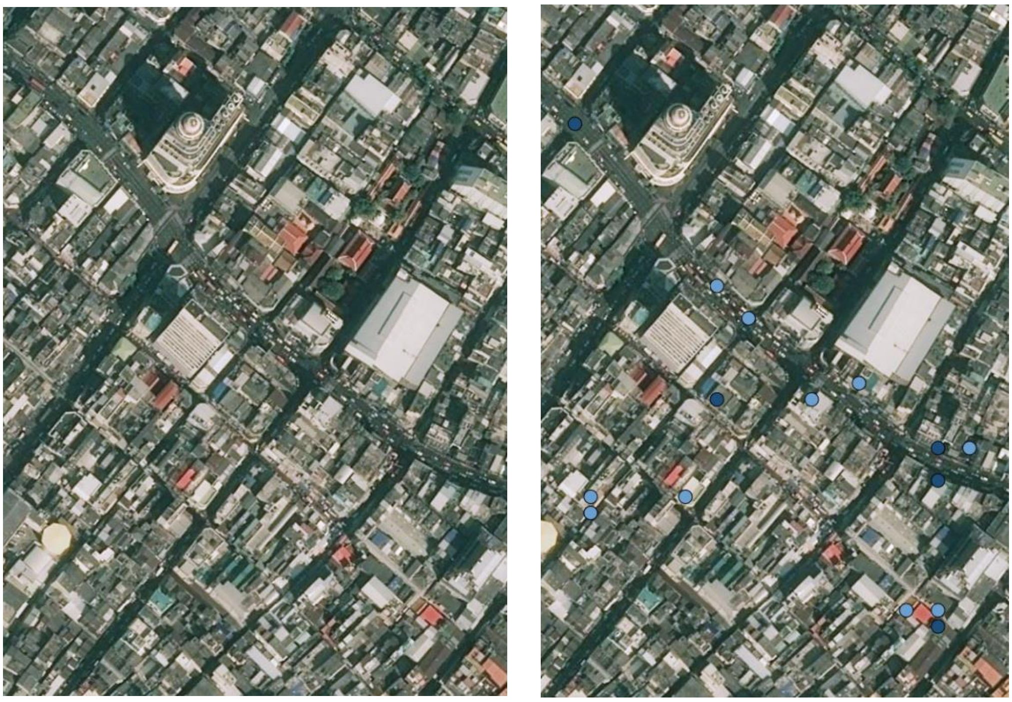
Results

1. The observations of the researcher were recorded in the Mosquito app.



(a) **(b)**

Figure 3 Map of Thailand and study site at Pahurat, Bangkok, Thailand. (a) Satellite maps of Pahurat and (b) Satellite map of Pahurat from GLOBE Observer application.



(a) **(b)**

Figure 4 Map of Thailand and study site at Yaowarat, Bangkok, Thailand. (a) Satellite maps of Yaowarat and (b) Satellite map of Yaowarat from GLOBE Observer application.

2. The number of mosquito larvae found in Chinese-Thai and Indian-Thai communities

Mosquito larvae	Chinese-Thai (49 containers)	Indian-Thai (44 containers)
Ae. aegypti	**3**	**47**
Ae. albopictus	**3**	**5**
Culex spp.	**1**	**5**
Anopheles spp.	**0**	**3**

Table 1 comparing the mean of *A. aegypti*, *A. albopictus*, *Culex spp.*, *Anopheles spp.*, and the total number of mosquito larvae found in Chinese-Thai and Indian-Thai communities.

Descriptive statistics showed that 3 *Ae. aegypti*, 3 *Ae. albopictus*, and 1 *Culex spp.* larvae were found in 49 containers in Chinese-Thai community and 47 *Ae. aegypti*, 5 *Ae. albopictus*, 3 *Culex spp.*, and 3 *Anopheles spp.* larvae were found in Indian-Thai community.

3. The differences in the number of larvae found in Chinese-Thai and Indian-Thai communities

mosquito larvae	Chinese-Thai		Indian-Thai		t	df	p
	Mean	SD	Mean	SD			
Ae. aegypti	.06	.429	1.07	4.658	-1.429	43.654	.160
Ae. albopictus	.06	.429	.11	.618	-.479	91	.633
Culex spp.	.02	.143	.11	.143	-.849	91	.398
Anopheles spp.	.00	.000	.07	.334	-1.430	91	.183
Total	.1429	1.00	1.3636	4.70572	-1.687	46.490	.098

*Sig<.05

Table 2 comparing the mean of *A. aegypti*, *A. albopictus*, *Culex spp.*, *Anopheles spp*., and the total number of mosquito larvae found in Chinese-Thai and Indian-Thai communities.

From table 2, it was found that there is no significant difference between the mean of each mosquito larva species and the total number of mosquito larvae observed in Chinese-Thai and Indian-Thai communities.

4. The difference between the container index in Chinese-Thai and Indian-Thai communities

	Chinese-Thai				**Indian-Thai**			
	Ae. aegypti	*Ae. albopictus*	*Culex spp.*	*Anopheles spp. larvae*	*Ae. aegypti*	*Ae. albopictus*	*Culex spp.*	*Anopheles spp. larvae*
No of containers	49	49	49	49	44	44	44	44
No of positive containers	1	1	1	0	5	2	1	2
Larval Index								
CI	2.04	2.04	2.04	0	11.36	4.55	2.27	4.55

CI = The number of containers positive for *Aedes* per 100 containers.

Table 3 comparing the container index of mosquito species in Chinese-Thai and Indian-Thai.

According to table 3, we found that the container indexes of *Ae. aegypti*, *Ae. albopictus*, *Culex spp.* and *Anopheles spp. larvae* in Indian-Thai communities were more than in Chinese-Thai communities.

Discussion

Comparing the study of our seniors (Kitkumchonskul, Khomwongthep, Kiattiyoscharoen, et al., 2019) we found different results. In their study about mosquito larvaes in Buddhist and Muslim faith-based communities in Samui island where most of the area were Buddhist faith-based, they found significantly more larvaes in Muslim faith-based communities. There was no container index mentioned. From our study, we found no significant difference in the number of mosquito larvae, but we further analyzed container index and found that there were more percentage of water-holding containers infested with *Ae. aegypti*. Knowing this information can help manage mosquito control policies to focus more force on Indian-Thai community area.

Conclusion

The researcher used the app to collect the information of mosquito larvae in the two communities. We found that in Chinese-Thai, there were 7 mosquitoes; in Indian-Thai, there were 60 mosquitoes. Using t-test independent, we found that the numbers of mosquito larvae found in the two communities were not significantly different. The container indexes of mosquito larvae in Indian-Thai were more than those in Chinese-Thai.

To improve the study, the research team could improve the following. First, we should collect the data in more samples. Moreover, we could sort the containers with mosquito larvae and analyze the data in that group. Finally, we could study more related research articles about mosquitoes in different communities.

Our group learned how to systematically collect information and realize how important it is to use this app and explore new things. Using the GLOBE Observer application, we could efficiently collect the data of mosquitoes.

Limitations

In our data collection, we took too few photographs of our survey, so we could not provide authentic evidence to show what we did. Due to the COVID-19, the research team could not collaborate effectively to collect information and find deep connections among the communities, mosquito larvae, and mosquito breeding sites.

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Appendix

SPSS Print-out

t-test independent print-out used to compare the mean mosquito larvae of Chinese-Thai and Indian-Thai communities

IBM SPSS Web Report - Output1.spv

T-Test

Group Statistics

	location	N	Mean	Std. Deviation	Std. Error Mean
Aedes aegypti larvae	Chinese	48	.00	.000	.000
	Hindi	44	1.07	4.658	.702
Aedes albopictus larvae	Chinese	49	.06	.429	.061
	Hindi	44	.11	.618	.093
Culex spp. larvae	Chinese	49	.02	.143	.020
	Hindi	44	.11	.754	.114
Anopheles spp. larvae	Chinese	49	.00	.000	.000
	Hindi	44	.07	.334	.050
Lall	Chinese	49	.1429	1.00000	.14286
	Hindi	44	1.3636	4.70572	.70941

IBM SPSS Web Report - Output1.spv

T-Test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Aedes aegypti larvae	Equal variances assumed	9.559	.003	-1.590	90	.115	-1.068	.672	-2.403	.267
	Equal variances not assumed			-1.521	43.000	.136	-1.068	.702	-2.484	.348
Aedes albopictus larvae	Equal variances assumed	.883	.350	-.479	91	.633	-.052	.109	-.270	.165
	Equal variances not assumed			-.470	75.525	.640	-.052	.112	-.275	.170
Culex spp. larvae	Equal variances assumed	3.021	.086	-.849	91	.398	-.093	.110	-.311	.125
	Equal variances not assumed			-.807	45.776	.424	-.093	.115	-.326	.139
Anopheles spp. larvae	Equal variances assumed	8.826	.004	-1.430	91	.156	-.068	.048	-.163	.027
	Equal variances not assumed			-1.354	43.000	.183	-.068	.050	-.170	.033
Lall	Equal variances assumed	9.750	.002	-1.773	91	.080	-1.22078	.68855	-2.58850	.14694
	Equal variances not assumed			-1.687	46.490	.098	-1.22078	.72365	-2.67701	.23545