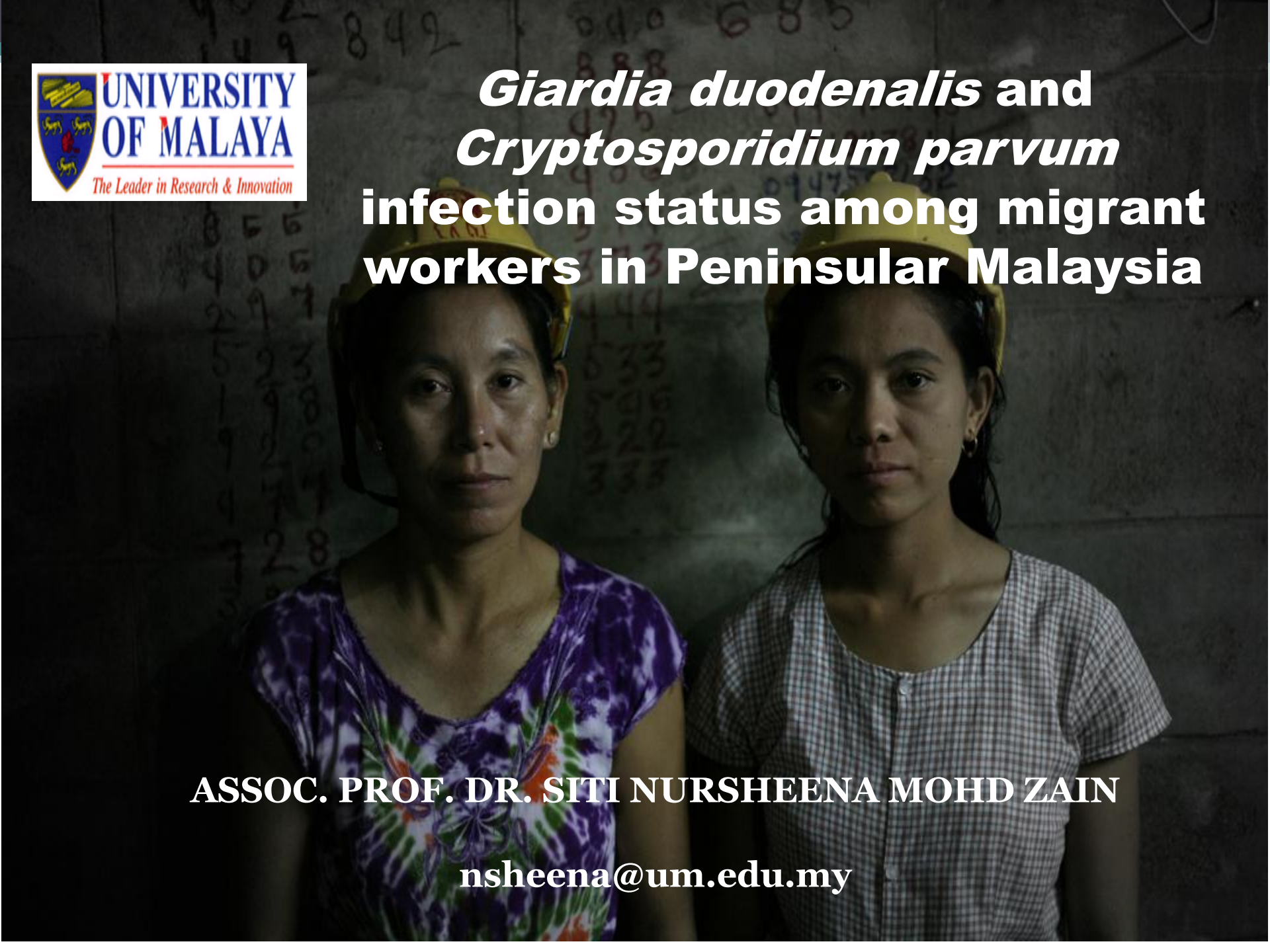

Giardia duodenalis and *Cryptosporidium parvum* infection status among migrant workers in Peninsular Malaysia

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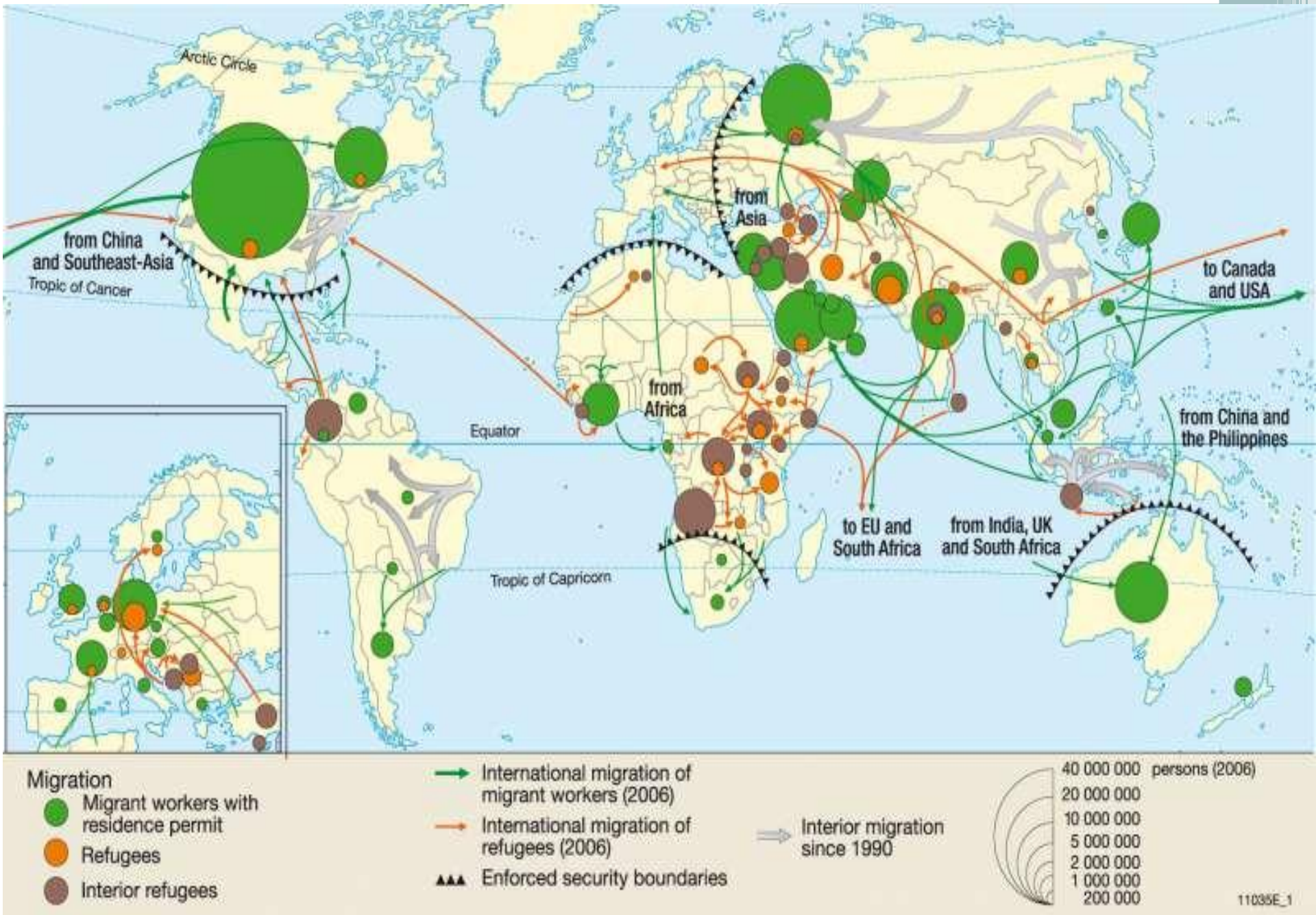

Arctic Circle
from China and Southeast-Asia
Tropic of Cancer
from Asia
to Canada and USA
from Africa
Equator
from China and the Philippines
to EU and South Africa
from India, UK and South Africa
Tropic of Capricorn
Migration
Migrant workers with residence permit
Refugees
Interior refugees
International migration of migrant workers (2006)
International migration of refugees (2006)
Enforced security boundaries
Interior migration since 1990
40 000 000 persons (2006)
20 000 000
10 000 000
5 000 000
2 000 000
1 000 000
200 000
11035E_1

Southeast Asia

- Better standard of living in Malaysia resulted in the influx of workers from neighbouring countries to Malaysia.

Figure 1:Malaysia and the neighbouring countries. Source: WorldAtlas.com, 2016

Table 1: Socio-demographic status between Malaysia and neighbouring countries (Indonesia, India, Bangladesh, Nepal, Myanmar and Vietnam).

	Malaysia	Indonesia	India	Bangladesh	Nepal	Myanmar	Vietnam
Population (July 2015 est.)	30,513,848	255,993,674	1,251,695,584	168,957,745	31,551,305	56,320,206	94,348,835
Population growth rate (2015 est.)	1.44%	0.92%	1.22%	1.6%	1.79%	1.01%	0.97%
Net migration rate (2015 est.)	-0.33 migrant(s)/ 1,000 population	-1.16 migrant(s)/ 1,000 population	-0.04 migrant(s)/ 1,000 population	0.46 migrant(s)/ 1,000 population	3.86 migrant(s)/1 ,000 population	-0.28 migrant(s)/ 1,000 population	-0.3 migrant(s)/ 1,000 population
Urbanization	74.7%	53.7%	32.7%	34.3%	18.6%	34.1%	33.6%
Sanitation facility access	96%	60.8%	39.6%	60.6%	45.8%	77.4%	78%
Drinking water resources	98.2%	87.4%	94.1%	86.9%	91.6%	80.6%	97.6%

Source: The World Factbook – Central Intelligence Agency (2016).

Migrant workers in Malaysia

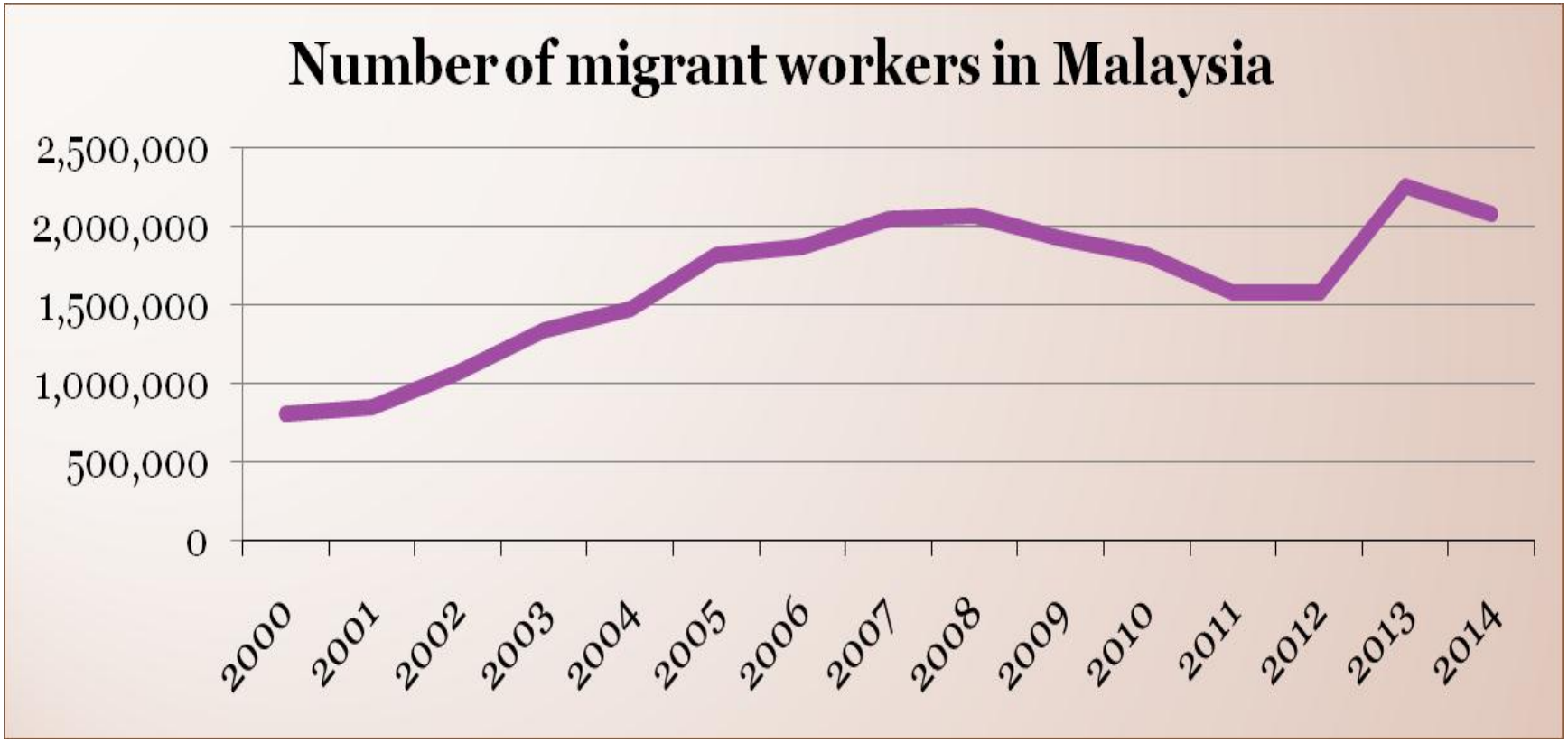
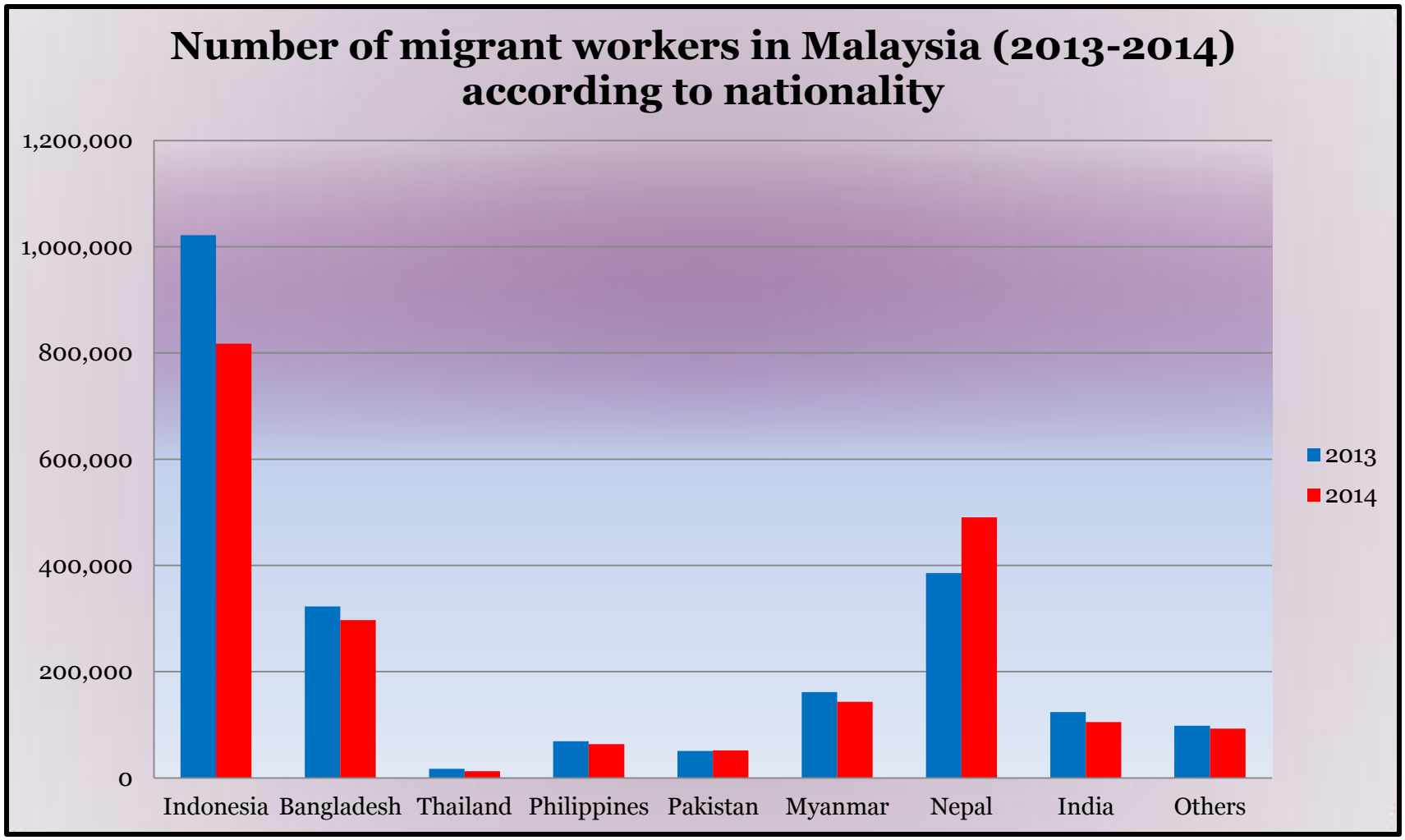


Figure 2. Source: Temporary Work Visit Pass (PLKS), Immigration Department (Ministry of Home Affairs)



* Others: Cambodia, China, Vietnam, Laos, Sri Lanka.

Figure 3. Source: Temporary Work Visit Pass (PLKS), Immigration Department (Ministry of Home Affairs)

Medical procedure of migrant workers in Malaysia

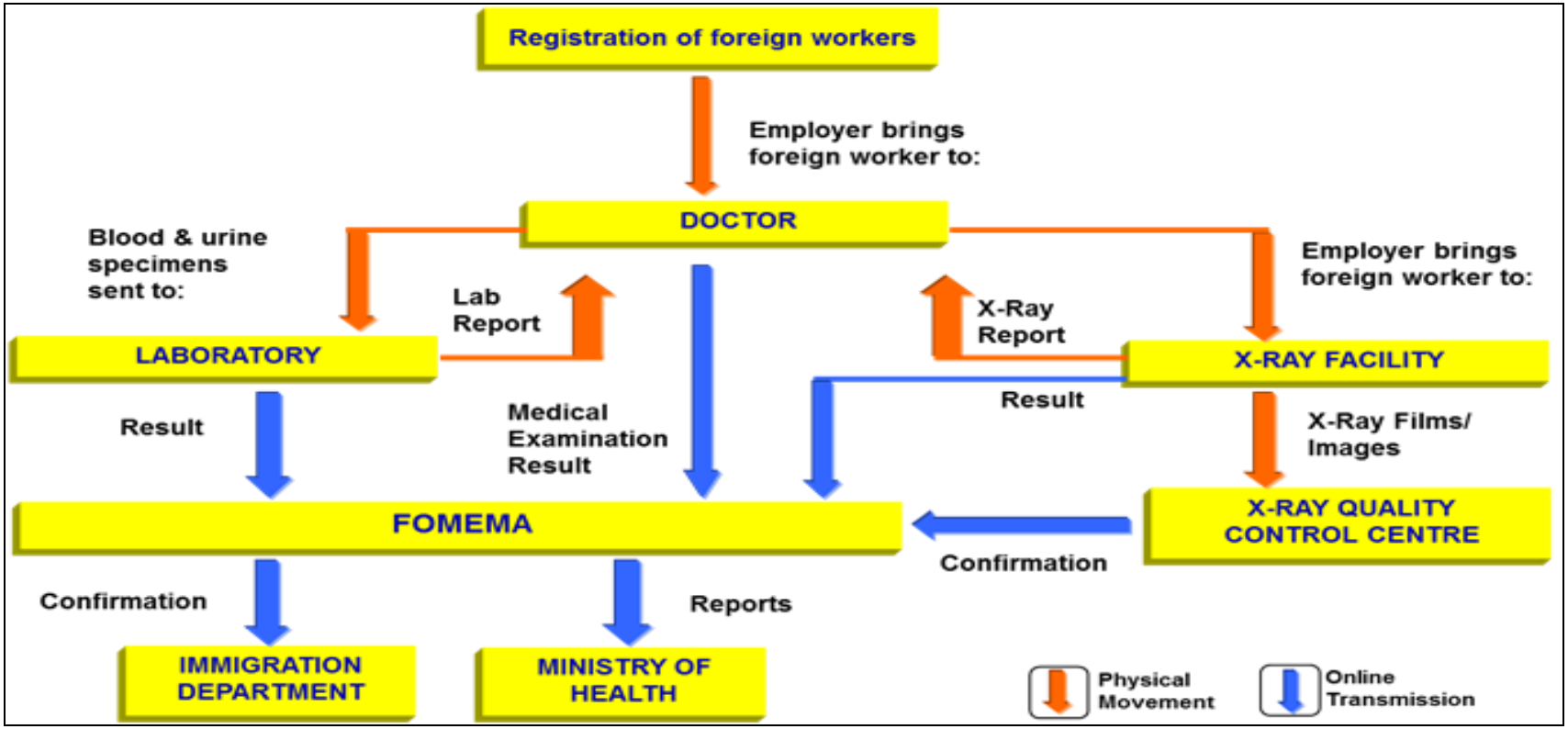


Figure 4: Medical screening process of migrant workers in Malaysia. Source: FOMEMA

- However, non-communicable disease screening is grossly inadequate or missing altogether.

Human Intestinal Protozoa

- Common human intestinal protozoan infections such as *Giardia duodenalis* and *Cryptosporidium* spp. has been reported worldwide (Norhayati et al., 2003; Ngui et al., 2011).
- Giardiasis is a diarrheal disease in a wide range of vertebrate hosts comprises six species namely, *Giardia duodenalis* (commonly found in humans), *G. agilis* (in amphibians), *G. ardeae* and *G. psittaci* (in birds), *G. microti* and *G. muris* (in rodents) (Adam, 2001).
- There are more than 27 species of Cryptosporidium being considered valid by investigators infecting human and other animals (Fayer, 2010; Traversa, 2010).
- The main causative agents of human cryptosporidiosis and of greater significance to public health are *C. parvum* and *C. hominis* (Fayer et al., 2000).

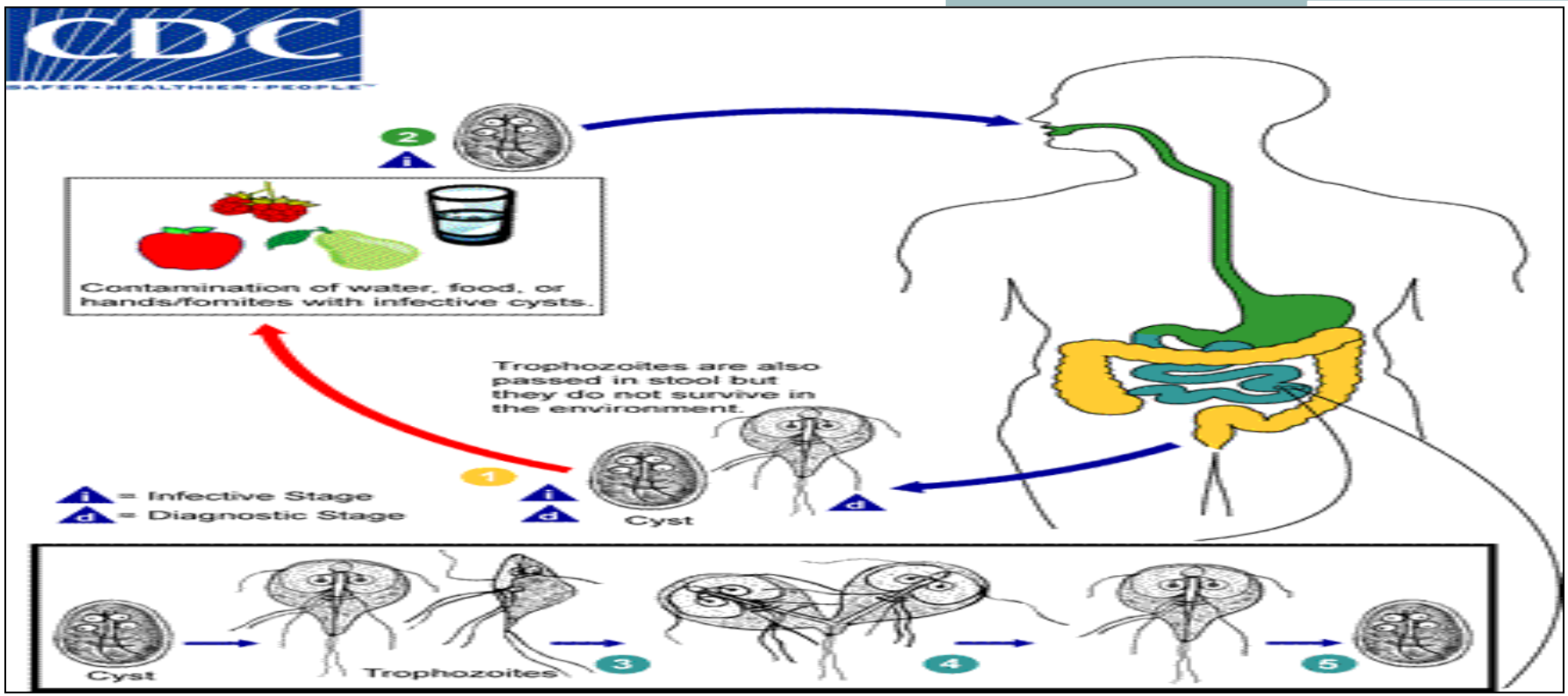


Figure 5: Life cycle of *Giardia* spp. Source: CDC, 2016

- The infection is spread from person to person by contamination of food with feces, or by direct fecal-oral contamination.
- Symptoms vary greatly from asymptomatic to diarrhea, gas or flatulence, greasy stool that float, stomach or abdominal cramps, upset stomach or nausea, dehydration and weight loss.

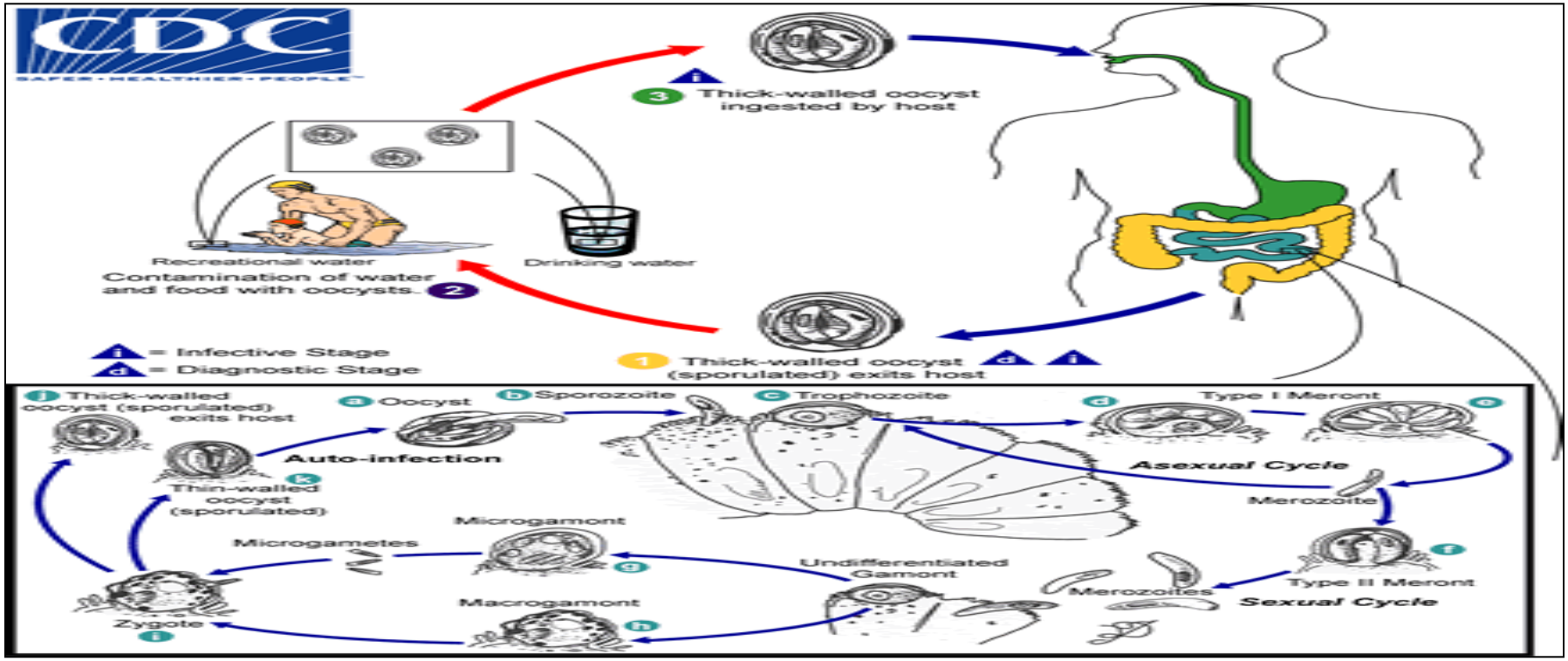


Figure 6: Life cycle of *Cryptosporidium* spp. Source: CDC, 2016

- Transmission of *Cryptosporidium parvum* and *C. hominis* occur mainly through contact with contaminated water (e.g., drinking or recreational water).
- Symptoms generally appear 2 to 10 days (average 7 days) after infection with watery diarrhea, stomach cramps or pain, dehydration, nausea, vomiting, fever and weight loss.

Methodology

A total of 388 migrant workers were successfully recruited and faecal samples were collected.
Research Ethics Reference number: MECID NO: 20143-40

Collected faecal samples were examined via microscopy for the presence of protozoa (40x magnification) using formalin ethyl acetate concentration technique followed by iodine staining and modified Ziehl-Neelsen staining method.

Molecular characterization:
Nested PCR with target gene (TPI gene) for *Giardia* spp.
RFLP- SSU rRNA gene for *Cryptosporidium* spp.

Results and Discussion

Analysis through microscopy showed :

- A total of **42 (10.8%)** samples were positive with ***Giardia* spp.**
- A total of **12 samples (3.1%)** were positive with ***Cryptosporidium* spp.**

Molecular analysis :

- PCR amplicons were successfully obtained for ***Giardia duodenalis*** from **30 (30/42; 71.4%)** samples at the triosephosphate isomerase (tpi) gene.

- PCR-RFLP analysis of the *Cryptosporidium* spp. showed **nine samples were *Cryptosporidium parvum*.**

Giardia duodenalis

- At the tpi gene, assemblages A and B were found in 13 (13/30; 43.3%) and 17 (17/30; 56.7%) samples, respectively.
- The presence of assemblage B and sub-assemblage AII in the samples of the present study suggest that the mode of transmission of giardiasis among migrant workers in Malaysia may be **human-to-human.**
- However, **further investigation should include multilocus genotyping** of parasites **from human and animals** to understand the epidemiology (Huey et al., 2013), possibility of zoonotic transmission and public health importance of *G. duodenalis* among migrant workers in Malaysia.

Table 2: The infections of *G. duodenalis* assemblages among migrant workers in Malaysia relative to factors

Factors		PCR Positive	Assemblage A		Assemblage B	
			No.	%	No.	%
Sex	Male	26	10	38.5	16	61.5
	Female	4	3	75.0	1	25.0
Age	<25	10	6	60.0	4	40.0
	25-34	16	6	37.5	10	62.5
	35-44	3	1	33.3	2	66.7
	45-54	1	0	0	1	100.0
	>55	0	0	0	0	0
Nationality	Indonesia	10	4	40.0	6	60.0
	Bangladesh	6	0	0	6	100.0
	Myanmar	0	0	0	0	0
	India	3	2	66.7	1	33.3
	Nepal	11	7	63.6	4	36.4
Employment Sector	Construction	2	0	0	2	100.0
	Manufacture	8	5	62.5	3	37.5
	Plantation	3	0	0	3	100.0
	Food Service	9	5	55.6	4	44.4
	Domestic	8	3	37.5	5	62.5
Years of residence in Malaysia	< than 1 year	17	9	52.9	8	47.1
	> than 1 year	13	4	30.8	9	69.2
Total		30	13	43.3	17	56.7

Cryptosporidium parvum

- Cryptosporidiosis in human was mainly caused by ***C. parvum*** and ***C. hominis*** (Xiao et al., 1999; Kosek et al., 2001)

- Zaidah et al., (2008) also reported that ***C. parvum* was the only species found among 9 HIV patients** in Kota Bharu, Kelantan.

- In the present study, most infected workers were from India (4/9; 44.4%), followed by Indonesia (2/9; 22.2%) then Bangladesh, Nepal and Myanmar with 11.1% respectively.

- In Indonesia, a community based study in Surabaya reported 8.2% of *C. parvum* oocysts were detected in diarrhea samples and indicated that **close contact with cats, rain, flood and crowded living condition were significant risk factors** (Katsumata et al., 1998).

Discussion and Recommendation

- These protozoa are commonly transmitted **via food and water** although foodborne and waterborne outbreaks of infections are uncommon in Malaysia.
- The potential of food and water contamination with protozoa from **hands that have not been washed after defecation** is of great concern especially among workers in food service sector.
- The infections in the study population must be considered as **public health concerns.**
- Parasite control strategies especially **treatment** and **health education** of foodborne and waterborne diseases are recommended for all migrant workers as well as local population of Malaysia.

Acknowledgements

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THANK YOU