APPENDIX Ai

Structured Questionnaire Form

Sampling Date:

Village Name:

Unit/House No:

A. Socio-Demography Characteristics

No.	Name	DOB (d/m/y)	Age	Gender	Educational attainment	Occupation	Household Income
1. 2. 3. 4. 5. 6. 7. 8. 9. 10.							

Age
1 = < 1 year
2 = 1- 4 years (Toddler)
3 = 5 - 6 years (Preschool)
4 = 7 - 12 years (Primary school)
5 = 13 – 17 years (Secondary school)
6 = > 18 years (Adults)

Gender
M = Male F = Female

Educational attainment
1 = No formal education
2 = Primary school
3 = Secondary school
4 = Other (please specify :_____)

Occupation
1 = Jungle product gatherer
2 = Rubber tapper
3 = Government employee
4 = Factory

5 = Palm oil plantation
6 = Labor (construction worker)
7 = Small business (mini sundry shop)
8 = Housewife/Not working
9 = Other (please specify :_____)

Household Income (RM/month)
1 = < RM 500
2 = >RM 500

B. Environmental and Sanitation Characteristics

Source of water supply
1 = Government pipe water
2 = River
3 = Well
4 = Rain water
* More than one answer is allowed ☐

Sanitation
Presence of latrine in the house
1 = Yes
2 = No ☐

Type of toilet facility
1 = Pour flush toilet available
2 = Pour flush toilet not available ☐

Defecation site
1 = Pour flush toilet
2 = Pit latrine
3 = River
4 = Bush
5 = Other (Please specify :_____) ☐
* More than one answer is allowed

Garbage disposal
1 = Collected
2 = Indiscriminately ☐

Domestic animal/livestock/pets
Presence of domestic animal
1 = Yes
2 = No ☐

Type of animal
1= Dogs
2= Cats
3= Chicken
4= Duck
5= Others (Please specify :_____)
* More than one answer is allowed ☐

Close contact with domestic animal
1 = Yes
2 = No ☐

C. Personal Hygiene Characteristics

Option answers for question (a) to (f):

1 = Yes
2 = No

Do you eat with hands? ☐

Do you bath at least once a day? ☐

Do you change your clothes at least once a day? ☐

Do you wear shoes when you go outside? ☐

Do you wash your hand before eating soon after playing with soil? ☐

Do you wash your hand after defecation? ☐

APPENDIX Aii

Borang Kaji Selidik

Tarikh Kajian:

Nama Kampung:

Nombor Rumah/Unit:

A. Maklumat Sosiodemografi Penduduk

No.	Nama	Tarikh lahir	Umur	Jantina	Tahap pendidikan	Pekerjaan	Pendapatan seisi rumah
1. 2. 3. 4. 5. 6. 7. 8. 9. 10.							

Umur
1 = < 1 tahun
2 = 1 – 4 tahun
3 = 5 – 6 tahun (Pra Persekolahan)
4 = 7 – 12 tahun (Sekolah Rendah)
5 = 13 – 17 tahun (Sekolah Menengah)
6 = >18 tahun (Dewasa)

Jantina
L = Lelaki P = Perempuan

Tahap pendidikan
1 = Pendidikan tidak formal
2 = Sekolah rendah
3 = Sekolah menengah
4 = Lain-lain (Sila nyatakan :_____)

Pekerjaan
1 = Pengumpul hasil hutan
2 = Penoreh Getah
3 = Kakitangan Kerajaan
4 = Pekerja Kilang
5 = Pekerja ladang kelapa sawit
6 = Buruh binaan
7 = Berniaga (kedai runcit)
8 = Suri rumah/Tidak bekerja
9 = Lain-lain (Sila nyatakan :_____)

Pendapatan isi rumah (RM sebulan)
1 = < RM 500
2 = > RM 500

B. Maklumat Kebersihan Persekiatran dan Sanitasi

Sumber bekalan air
1 = Air paip kerajaan
2 = Sungai
3 = Perigi
4 = Air hujan
* Lebih daripada satu jawapan dibenarkan ☐

Penjagaan kebersihan
Kemudahan tandas di dalam rumah ☐
1 = Ya
2 = Tidak

Jenis kemudahan tandas
1 = Terdapat tandas bilas
2 = Tidak terdapat tandas bilas ☐

Tempat membuang air besar
1 = Tandas bilas
2 = Tandas lubang tanah
3 = Sungai
4 = Belukar
5 = Lain-lain (Sila nyatakan :_____) ☐
* Lebih daripada satu jawapan dibenarkan

Temapt pembuangan sampah
1 = Dikumpul
2 = Merata-rata ☐

Haiwan peliharaan/ternakan

Adakah anda memiliki binatang peliharaan atau binatang ternakan?
1 = Ya
2 = Tidak ☐

Adakah anda rapat atau bermain dengan haiwan peliharaan atau ternakan ini?
1 = Ya
2 = Tidak ☐

Jenis haiwan
1 = Anjing
2 = Kucing
3 = Ayam
4 = Itik
5 = Lain-lain (Sila nyatakan :_____) ☐
* Lebih daripada satu jawapan dibenarkan

C. Maklumat Kebersihan Diri

Pilihan jawapan untuk soalan (a) hingga (g):

1 = Ya
2 = Tidak

Adakah anda makan menggunakan tangan? ☐

Adakah anda mandi sekurang-kurangnya sekali sehari? ☐

Adakah anda menukar pakaian sekurang-kurangnya sekali sehari? ☐

Adakah anda memakai kasut / selipar semasa keluar rumah? ☐

Adakah anda mencuci tangan sebelum makan selepas? ☐

Adakah anda mencuci tangan selepas membuang air besar? ☐

APPENDIX B

Formalin Ether Concentration Technique

1. Fecal sample was mixed with 7 ml of 10% formalin into a clean plastic centrifuge tube.

2. Fecal sample was strained through two layers of damped gauze and decanted into a new plastic centrifuge tube.

3. The supernatant was mixed with 2 to 3 ml of ethyl acetate.

4. The tube was centrifuge for 2 minutes at 2000 rpm. The centrifugation resulted in 4 layers; ethyl acetate, debris, formalin and sediment with parasites.

5. The supernatant was decanted by inverting the centrifuge tube in one smooth motion.

6. The sediment was withdrawn with a plastic Pasteur pipette and mixed with 0.85% normal saline and iodine on a clean and dry microscope slides.

7. The smear was covered with cover slip.

8. Slide was examined using light microscope starting from low power to high magnification power (10 X, 40 X).

9. Detection of intestinal parasites was determined on the basis of morphological characteristic of specific species under microscopic examination. One of each sample was examined and the result was considered as positive when at least one parasite egg or larvae was observed in the employed technique.

APPENDIX C

Genomic DNA Extraction

A. MO BIO PowerSoil® DNA Isolation Kit (cat. no. 12888-100)

1. Add approximately 0.25 grams of fecal samples to the provided **PowerBead tubes**. Gently vortex the mix.
2. Add 60 µl of S**olution C1** and invert several times or vortex briefly. **Note:** Check **Solution C1**, if it is precipitated, heat solution to 60°C until dissolved before used.
3. Secure **PowerBead Tubes** horizontally using the **MO BIO Vortex Adapter** (MO BIO Catalog No. 13000-V1) tube holder and vortex at maximum speed for 10 minutes. Centrifuge **PowerBead Tubes** at 10,000 x *g* for 30 seconds at room temperature. **Caution:** Do not exceed 10,000 x *g* or tubes may break.
4. Transfer approximately 400 to 500 µl of the supernatant to a provided **2 ml Collection Tube**.
5. Add 250 µl of **Solution C2** and vortex for 5 seconds. Incubate at 4°C for 5 minutes.
6. Centrifuge the tubes for 1 minute at 10,000 x *g* at room temperature.
7. Avoiding the pellet, transfer up to, but no more than 600 µl of supernatant into a provided **2 ml Collection Tube**.
8. Add 200 µl of **Solution C3** and vortex for 5 seconds. Incubate at 4°C for 5 minutes.
9. Centrifuge the tubes for 1 minute at 10,000 x *g* at room temperature.
10. Avoiding the pellet, transfer up to, but no more than 750 µl of supernatant into a provided **2 ml Collection Tube**.
11. Add 1200 µl **Solution C4** to the supernatant and vortex for 5 seconds. **Note:** Shake to mix **Solution C4** before use.
12. Load approximately 675 µl onto a provided **Spin Filter** and centrifuge at 10,000 x *g* for 1 minute at room temperature. Discard the flow thorough and add an additional 675 µl of supernatant to the **Spin Filter** and centrifuge at 10,000 x *g* for 1 minute at room temperature. Load the remaining supernatant onto the **Spin Filter** and centrifuge at 10,000 x *g* for 1 minute at room temperature. Note: A total of 3 loads for each sample processed are required.
13. Add 500 µl of **Solution C5** and centrifuge at room temperature for 1 minute at 10,000 x *g*.
14. Discard the flow through.
15. Centrifuge again at room temperature for 1 minute at 10,000 x *g*.
16. Carefully transfer **Spin Filter** in a provided **2 ml Collection Tube**. Avoid splashing any **Solution C5** onto the **Spin Filter**.
17. Add 100 µl of **Solution C6** to the centre of the white membrane. Alternatively, sterile DNA free water (DNase/RNase free water, Sigma Cat. no. W4502, St. Louis, MO) may be used for elution from the silica membrane **Spin Filter** membrane at this step.

18. Leave for 1 minute at room temperature.
19. Centrifuge at room temperature for 30 seconds at 10,000 x *g*.
20. Discard the **Spin Filter**. The DNA in the tube is now ready for any downstream application. Store the DNA at -20°C until to be used.

B. QIAamp® DNA Mini Kit (QIAgen, Hilden, Germany)

Before Starting

1. Equilibrate the sample and solution to room temperature.
2. Heat 2 water baths or heating blocks: one to 56°C for use in step 3 and one to 70°C for use in step 4.
3. Add **ethanol (96-100%)** to **Buffer AW1** and **Buffer AW2** before use.

Procedure

1. Add a single adult worm to a **1.5 ml microcentrifuge** tube containing no more than 80 µl **Phosphate Buffer Saline (PBS)**. Homogenize the sample suing the standard **rotor-stator homogenizer**. Add 100 µl **Buffer ATL**.
2. Add 20 µl **protienase K**, mix by vortexing and incubate at 56°C until the tissue is completely lysed. Vortex occasionally during incubation to disperse the sample or place in a shaking water bath.
3. Briefly centrifuge the **1.5 ml microcentrifuge tube** to remove drops from the inside of the lid.
4. Add 200 µl **Buffer AL** to the sample, mix by pulse-vortexing for 15 seconds and incubate at 70°C for 10 minutes.
5. Briefly centrifuge the **1.5 ml microcentrifuge tube** to remove drops from inside the lid.
6. Add 200 µl **ethanol (96-100%)** to the sample, mix by pulse-vortexing for 15 seconds.
7. After mixing, briefly centrifuge **1.5 ml microcentrifuge tube** to remove drops from the inside of the lid.
8. Carefully apply the mixture including the precipitate from step 6 to the **QIAamp Mini Spin Column** in a new **2 ml collection tube** and centrifuge at 8,000 rpm for 1 minute.
9. Place **QIAamp Mini Spin Column** in a new **2 ml collection tube** and discard the tube containing the filtrate.
10. Carefully open the **QIAamp Mini Spin Column** and add 500 µl **Buffer AW1** without wetting the rim. Centrifuge at 8,000 rpm for 1 minute.
11. Place **QIAamp Mini Spin Column** in a new **2 ml collection tube** and discard the tube containing the filtrate.
12. Carefully open the **QIAamp Mini Spin Column** and add 500 µl **Buffer AW2** without wetting the rim. Centrifuge at 14,000 rpm for 3 minutes.

13. Place **QIAamp Mini Spin Column** in a new **2 ml collection tube** and discard the old collection tube with the filtrate. Centrifuge at 14,000 rpm for 1 minute.
14. Place **QIAamp Mini Spin Column** in a new **2 ml collection tube** and discard the tube containing the filtrate.
15. Carefully open the **QIAamp Mini Spin Column** and add 200 µl **Buffer AE** or distilled water. Incubate at room temperature for 1 minute and then centrifuge at 8,000 rpm for 1 minute.
16. Repeat step 15. The DNA in the tube is now ready for any downstream application. Store the DNA at -20°C until to be used.

APPENDIX D

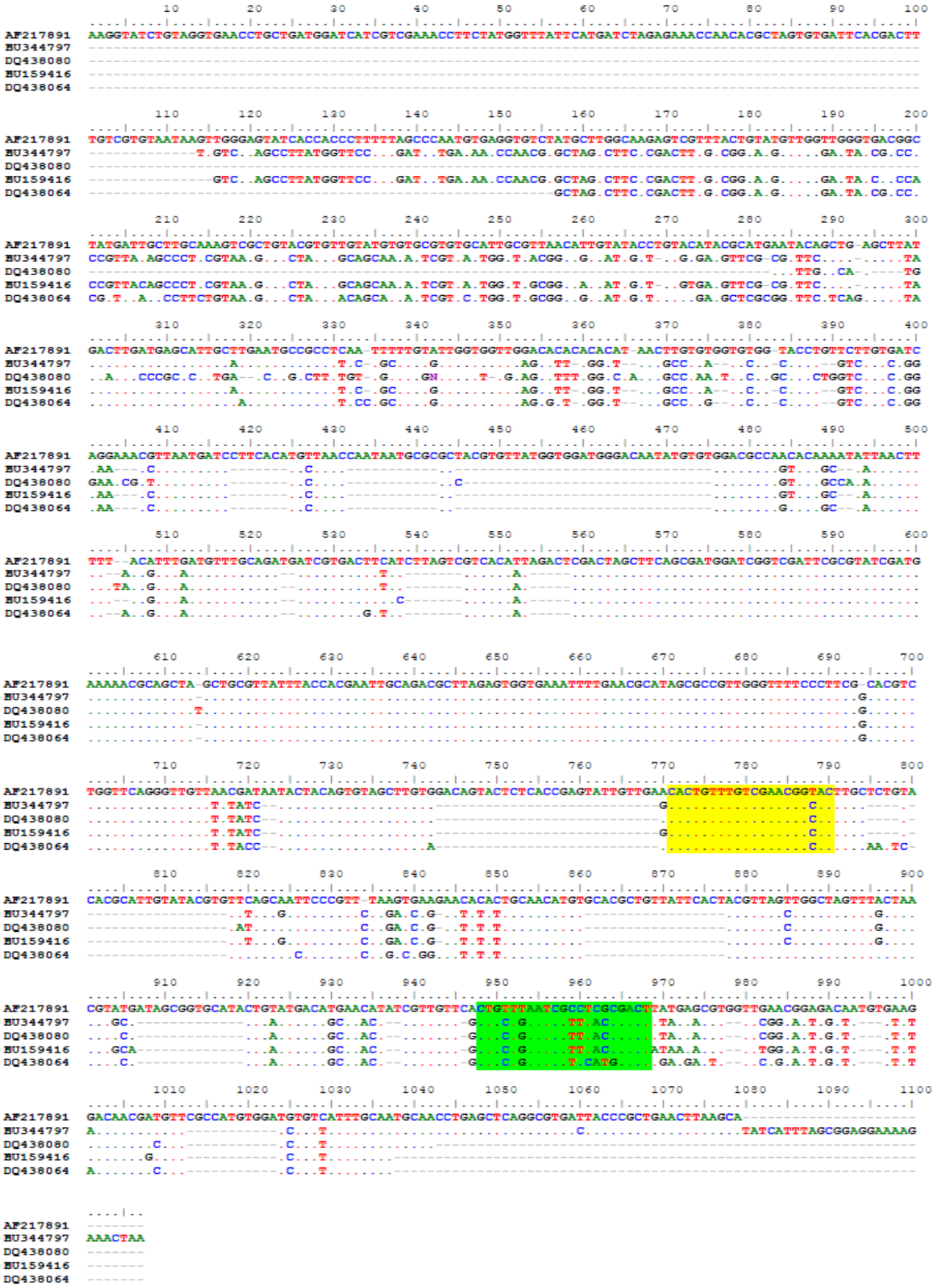

Figure D.1: Multiple sequence alignment of the **second partial internal transcribed spacer (ITS-2) ribosomal RNA gene** of five hookworm species employed in the primer design. Yellow highlight represents forward primer. Green highlight represents reverse primer

APPENDIX E

Real Time PCR and High Resolution Melting (HRM) Thermocycling Condition

MeltDoctor™ HRM Master Mix

Applied Biosystems

Insert PN 4426225 Rev. B
Printed in USA

For Research Use Only.
Not for use in diagnostic procedures.

Run the reaction plate

1. Run the reaction plate using the recommended conditions:

Instrument and system software	Document/experiment properties	Thermal profile/run method settings
Applied Biosystems 7900HT Fast Real-Time PCR System, SDS Software v2.3	• Assay: Standard Curve (AQ) • Container: 96 Wells Clear Plate or 384 Wells Clear Plate • Template: Blank Template	• Passive Reference: None • Sample Volume (µL): 20 • Mode: Standard
Applied Biosystems 7500 Fast Real-Time PCR System, 7500 Software v2.0	• Instrument: 7500 Fast (96 Wells) • Experiment type: Quantitation-Standard Curve • Reagents: Other, select the Include Melt Curve checkbox • Ramp speed: Standard (~2 hours to complete a run)	• Reaction Volume Per Well: 20 µL • Passive reference: None • Expert mode: Select the Expert Mode checkbox • Filter selection: Select the Filter-1 checkbox

Note: If you are running a 96-well Fast reaction plate on the 7900HT system, perform the melt curve stage in a separate run. After the amplification run, remove the plate from the instrument, then spin the plate briefly before returning the plate to the instrument for the melt curve run.

Stage	Step	Temp	Time	Ramp rate (7900HT only)
Holding	Enzyme activation	95 °C	10 min	100%
Cycling (40 cycles)	Denature	95 °C	15 sec	100%
	Anneal/extend	60 °C	1 min	100%
Melt curve/dissociation	Denature	95 °C	10 sec	100%
	Anneal	57-60 °C	1 min	100%
	High resolution melting	95 °C	15 sec	1%
	Anneal	60 °C	15 sec	100%

2. Save the file.
3. Using the instrument system software, review the amplification results.
4. Using the Applied Biosystems High Resolution Melting Software, review the melt curves.

Part Number 4426225 Rev. B 07/2009

Applied Biosystems

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Technical Resources and Support
For the latest technical resources and support information for all locations, please refer to our Web site at www.appliedbiosystems.com/support

APPENDIX F

PCR Product Analysis

A. 2% Agarose Gel

1. Add 2 gram of **agarose powder** to 100 ml of **1X TAE buffer**.
2. Melt the mixture thoroughly in a microwave oven and leave to cool at room temperature.
3. Add 3 ml of **SYBR Safe DNA stain** (Invitrogen, cat. no. S33102, Ontario, Canada) to the agarose solution.
4. Mix the mixture by swirling and pour into a gel mould fitted with the appropriate comb
5. Leave the mixture to solidify at room temperature.
6. Transfer the solidify gel to the gel tank containing **1X TAE buffer**.

B. Gel Electrophoresis

1. Mix 5 µl of **PCR product** by repeated pipetting with 3 µl of **6X loading dye** (Fermentas, cat. no. SM0241, Ontario, Canada) on a small sheet of clean parafilm (PARAFILM, USA).
2. Carefully transfer each of the mixture with a pipette into the respective well set in the agarose gel.
3. Dilute **100 bp DNA ladder** (Fermentas, cat. no. SM0241, Ontario, Canada) in **TE buffer** (10mM Tris-HCL, 1mM EDTA, pH 8.0) and **1X loading dye** to give a final concentration of 0.5 µg/10µl. This serve as a reference.
4. Add the mixture to the well designated as a reference in each run.
5. Run the gel at 100 volts for 35 minutes.
6. Finally, view the stained DNA with SYBR Safe by ultraviolet light illumination using UV transiluminator.
7. Take the gel image and save ass reference.

APPENDIX G

PCR Product Purification (QIAgen, cat. no. 28104, Hilden, Germany)

Before Starting

1. Add **ethanol (96-100%)** to **Buffer PE** before use.
2. Add 1:250 volume **pH indicator I** to **Buffer PB** (i.e., add 120 µl **pH indicator** I to 30 ml **Buffer PB** or add 600 µl **pH indicator** I to 150 ml **Buffer PB**). The yellow color of **Buffer PB** with **pH indicator I** indicates a pH of ≤7.5.

Procedure

1. Add 5 volumes of **Buffer PB** to 1 volume of the PCR sample and mix.
   For example, add 500 µl **Buffer PB** to a 100 µl PCR sample.
2. If pH indicator 1 has being added to **Buffer PB**, check that the color of the mixture is yellow.
   If the color of the mixture is orange or violet, add 10 µl of **3 M sodium acetate**, pH 5.0 and mix. The color of the mixture will turn to yellow.
3. Place a **QIAquick spin column** in a provided **2 ml collection tube**.
4. To bind DNA, apply the sample to the **QIAquick spin column** and centrifuge for 1 minute at 13,000 rpm.
5. Discard the flow-through and place **QIAquick spin column** back into the same tube.
6. To wash, add 750 µl of **Buffer PE** and centrifuge for 1 minute at 13,000 rpm.
7. Discard the flow-through and place the **QIAquick spin column** back in the same tube. Centrifuge for an additional 1 minute.
8. Place the **QIAquick spin column** in a clean **1.5 ml microcentrifuge tube**.
9. To elute DNA, add 100-200 µl of Buffer EB (10mM Tris.Cl, pH 8.5) or water (pH 7.0-8.5) to the centre of the **QIAquick spin column** membrane and centrifuge the column for 1 minute at 13,000 rpm. Alternatively, for increased DNA concentration, add 30-50 µl elution buffer to the centre of the **QIAquick spin column** membrane, let the column stand for 1 minute and then centrifuge.

APPENDIX H

Table H.1: GenBank accession numbers of **ITS-2 ribosomal RNA gene** of *Necator americanus* isolated from human

Isolates	Location/Village	Host	GenBank Accession number
G7	Gurney, Hulu Selangor	Human	JF960375
G8	Gurney, Hulu Selangor	Human	JF960376
G10	Gurney, Hulu Selangor	Human	HQ452537
G20	Gurney, Hulu Selangor	Human	JF960377
G25	Gurney, Hulu Selangor	Human	HQ452538
G27	Gurney, Hulu Selangor	Human	JF960378
G38	Gurney, Hulu Selangor	Human	JF960379
G41	Gurney, Hulu Selangor	Human	HQ452539
G42	Gurney, Hulu Selangor	Human	HQ452540
UY1	Gurney, Hulu Selangor	Human	JF960380
UY6	Gurney, Hulu Selangor	Human	JF960381
UY7	Gurney, Hulu Selangor	Human	JF960382
UY9	Gurney, Hulu Selangor	Human	JF960383
UY24	Gurney, Hulu Selangor	Human	JF960384
UY27	Gurney, Hulu Selangor	Human	JF960385
UY33	Gurney, Hulu Selangor	Human	JF960386
UY36	Gurney, Hulu Selangor	Human	JF960387
UY38	Gurney, Hulu Selangor	Human	JF960388
UY52	Gurney, Hulu Selangor	Human	HQ452542
UY56	Gurney, Hulu Selangor	Human	HQ452543
UY83	Gurney, Hulu Selangor	Human	JF960389
PI9	Pos Iskandar, Bera	Human	JF960393
PI10	Pos Iskandar, Bera	Human	JF960394
PI15	Pos Iskandar, Bera	Human	JF960395
PI17	Pos Iskandar, Bera	Human	JF960396
PI25	Pos Iskandar, Bera	Human	JF960397
PI58	Pos Iskandar, Bera	Human	JF960398
PI66	Pos Iskandar, Bera	Human	JF960399
PI75	Pos Iskandar, Bera	Human	JF960400
PI77	Pos Iskandar, Bera	Human	JF960401
PI89	Pos Iskandar, Bera	Human	JF960402

BS22	Bukit Serok, Rompin	Human	JF960370
BS48	Bukit Serok, Rompin	Human	JF960371
BS67	Bukit Serok, Rompin	Human	JF960372
BS78	Bukit Serok, Rompin	Human	JF960373
BS94	Bukit Serok, Rompin	Human	JF960374
KP1	Kuala Pangsun, Hulu Langat	Human	JF960390
KP12	Kuala Pangsun, Hulu Langat	Human	JF960391
KP15	Kuala Pangsun, Hulu Langat	Human	JF960403
KP43	Kuala Pangsun, Hulu Langat	Human	JF960392
KI24	Sungai Bumbun, Kuala Langat	Human	HQ452541

Table H.2: GenBank accession numbers of **ITS-2 ribosomal RNA gene** of *Ancylostoma ceylanicum* isolated from human, dogs and cats

Isolates	**Location/Village**	**Host**	**GenBank Accession number**
G18	Gurney, Hulu Selangor	Human	JF960363
G23	Gurney, Hulu Selangor	Human	HQ452515
G25	Gurney, Hulu Selangor	Human	HQ452516
G27	Gurney, Hulu Selangor	Human	JF960364
UY27	Gurney, Hulu Selangor	Human	JF960365
PI11	Pos Iskandar, Bera	Human	JF960368
PI15	Pos Iskandar, Bera	Human	JF960369
BS94	Bukit Serok, Rompin	Human	JF960362
KP14	Kuala Pangsun, Hulu Langat	Human	JF960366
KP17	Kuala Pangsun, Hulu Langat	Human	JF960367
KI19	Sungai Bumbun, Kuala Langat	Human	HQ452517
UY1	Gurney, Hulu Selangor	Dog	HQ452522
UY2	Gurney, Hulu Selangor	Dog	HQ452523
UY3	Gurney, Hulu Selangor	Dog	HQ452524
UY7	Gurney, Hulu Selangor	Dog	HQ452525
UY15	Gurney, Hulu Selangor	Dog	HQ452527
SP1	Gurney, Hulu Selangor	Dog	JN164657
SP2	Gurney, Hulu Selangor	Dog	JN164658

SP3	Gurney, Hulu Selangor	Dog	JN164659
SP5	Gurney, Hulu Selangor	Dog	JN164661
D6	Kuala Pangsun, Hulu Langat	Dog	JN120871
D22	Kuala Pangsun, Hulu Langat	Dog	JN120873
D25	Kuala Pangsun, Hulu Langat	Dog	JN120874
KI2	Sungai Bumbun, Kuala Langat	Dog	HQ452518
KI3	Sungai Bumbun, Kuala Langat	Dog	HQ452519
BD1	Sungai Miak, Bentong	Dog	JN120876
BD7	Sungai Miak, Bentong	Dog	JN120877
BD8	Sungai Miak, Bentong	Dog	JN120878
KD1	Kemensah, Hulu Klang	Dog	JN120880
KD8	Kemensah, Hulu Klang	Dog	JN120881
UY14	Gurney, Hulu Selangor	Cat	HQ452526
C5	Kuala Pangsun, Hulu Langat	Cat	JN120875
KI13	Sungai Bumbun, Kuala Langat	Cat	HQ452520
KI14	Sungai Bumbun, Kuala Langat	Cat	HQ452521

Table H.3: GenBank accession numbers of **ITS-2 ribosomal RNA gene** of *Ancylostoma caninum* isolated from dogs and cats

Isolates	**Location/Village**	**Host**	**GenBank Accession number**
UY5	Gurney, Hulu Selangor	Dog	HQ452532
UY6	Gurney, Hulu Selangor	Dog	HQ452533
UY9	Gurney, Hulu Selangor	Dog	HQ452534
UY11	Gurney, Hulu Selangor	Dog	HQ452535
UY12	Gurney, Hulu Selangor	Dog	HQ452536
SP4	Gurney, Hulu Selangor	Dog	JN164660
D4	Kuala Pangsun, Hulu Langat	Dog	JN120882
D5	Kuala Pangsun, Hulu Langat	Dog	JN120883
D7	Kuala Pangsun, Hulu Langat	Dog	JN120884
D9	Kuala Pangsun, Hulu Langat	Dog	JN120885
D10	Kuala Pangsun, Hulu Langat	Dog	JN120886
D13	Kuala Pangsun, Hulu Langat	Dog	JN120887
D16	Kuala Pangsun, Hulu Langat	Dog	JN120888

Isolates	Location/Village	Host	GenBank Accession number
D19	Kuala Pangsun, Hulu Langat	Dog	JN120889
D21	Kuala Pangsun, Hulu Langat	Dog	JN120890
D24	Kuala Pangsun, Hulu Langat	Dog	JN120891
D26	Kuala Pangsun, Hulu Langat	Dog	JN120892
D27	Kuala Pangsun, Hulu Langat	Dog	JN120893
KI1	Sungai Bumbun, Kuala Langat	Dog	HQ452529
KI4	Sungai Bumbun, Kuala Langat	Dog	HQ452530
KI6	Sungai Bumbun, Kuala Langat	Dog	HQ452531
BD2	Sungai Miak, Bentong	Dog	JN120894
KD4	Kemensah, Hulu Klang	Dog	JN120895
KD5	Kemensah, Hulu Klang	Dog	JN120896
KD10	Kemensah, Hulu Klang	Dog	JN120897

Table H.4: GenBank accession numbers of **ITS-2 ribosomal RNA gene** of *Ancylostoma braziliense* isolated from cat

Isolates	Location/Village	Host	GenBank Accession number
KP31	Kuala Pangsun, Hulu Langat	Cat	JN120898

Table H.5: GenBank accession numbers of ***cox 1* gene** of *Ancylostoma ceylanicum* isolated from human, dogs and cats

Isolates	Location/Village	Host	GenBank Accession number
G18	Gurney, Hulu Selangor	Human	KC247737
G23	Gurney, Hulu Selangor	Human	KC247745
PI15	Pos Iskandar, Bera	Human	KC247738
BS94	Bukit Serok, Rompin	Human	KC247734
KP14	Kuala Pangsun, Hulu Langat	Human	KC247744
KP17	Kuala Pangsun, Hulu Langat	Human	KC247740
UY1	Gurney, Hulu Selangor	Dog	KC247732
UY2	Gurney, Hulu Selangor	Dog	KC247735
UY3	Gurney, Hulu Selangor	Dog	KC247736
UY7	Gurney, Hulu Selangor	Dog	KC247733
SP1	Gurney, Hulu Selangor	Dog	KC247731
D6	Kuala Pangsun, Hulu Langat	Dog	KC247742
D22	Kuala Pangsun, Hulu Langat	Dog	KC247727
KI2	Sungai Bumbun, Kuala Langat	Dog	KC247729
KI3	Sungai Bumbun, Kuala Langat	Dog	KC247730
BD1	Sungai Miak, Bentong	Dog	KC247739
BD7	Sungai Miak, Bentong	Dog	KC247741
UY14	Gurney, Hulu Selangor	Cat	KC247728
C5	Kuala Pangsun, Hulu Langat	Cat	KC247743

APPENDIX I

Table I.1: Summary of the Remote Sensing (RS) data and sources

Data type	Data source
Peninsular Malaysia Map (Base map)	Department of Surveying and Mapping, Malaysia
Land Surface Temperature (LST) *	WorldClim website
Normalized Difference Vegetation Index (NDVI) *	Moderate Resolution Imaging Spectroradiometer (MODIS)
Elevation (Digital Elevation Model, DEM)	Department of Survey and Mapping, Malaysia
Population data 2010 National Census	Department of Statistics, Malaysia

* Courtesy of Prof Simon Brooker and Dr Rachel Pullan from London School of Hygiene and Tropical Medicine (LSHTM), United Kingdom

APPENDIX J

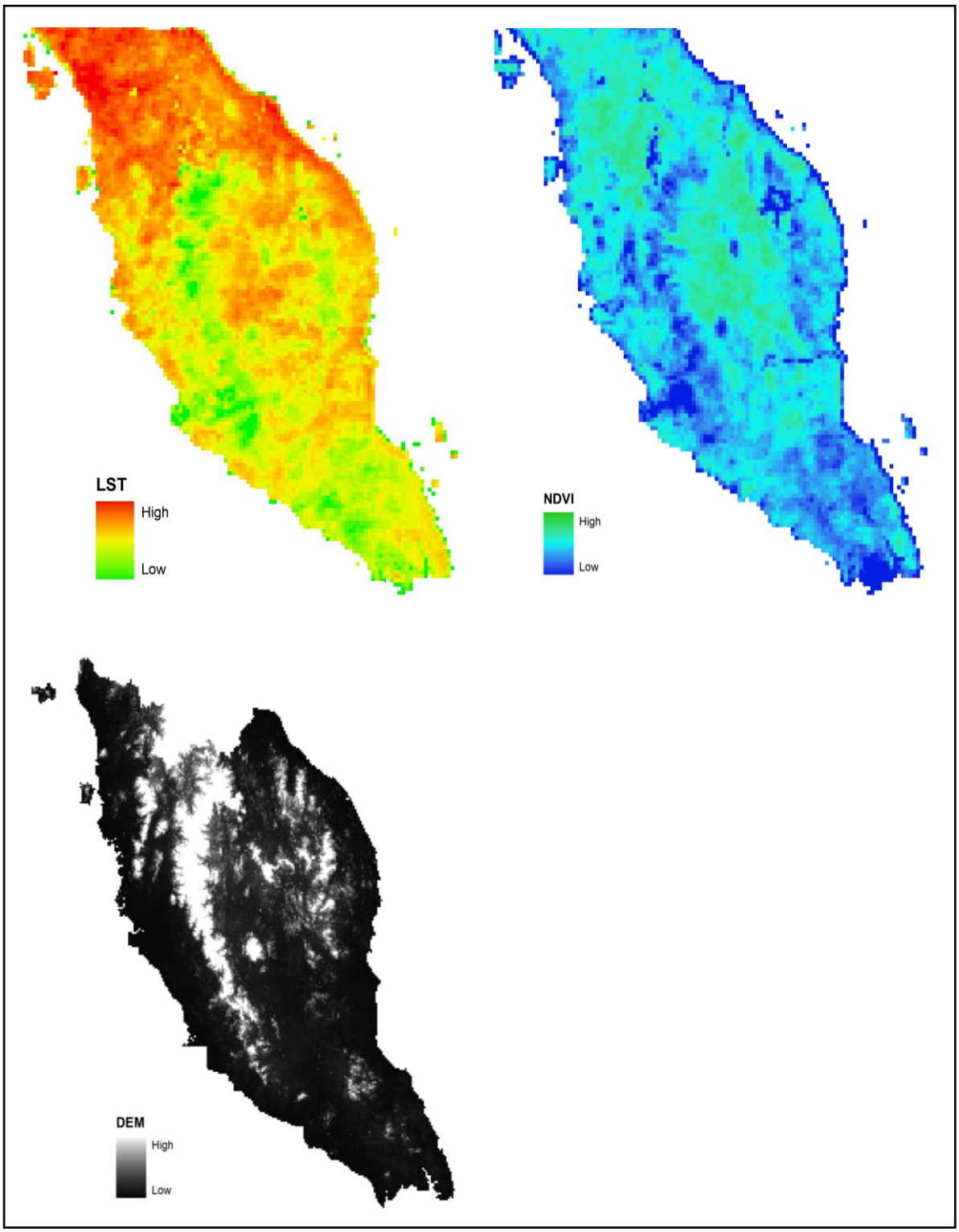

Figure J.1: Maps shows the Land Surface Temperature (LST), Normalized Difference Vegetation Index (NDVI) and Digital Elevation Model (DEM) of Peninsular Malaysia

APPENDIX K

Turning Logistic Regression Model into Predicted Probability Risk Map

Best fit logistic regression equations can be used to map probability of infection prevalence being 50% or more. The general equation of the logistic regression model is:

$$\textbf{log odds of outcome} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots\ldots + \beta_p x_p = + \beta' x$$

Where β_i is the regression coefficient for variable x_i

This equation can be re-written as follows:

$$\textbf{log odds of outcome} = \log\left[\frac{p}{1-P}\right] = \text{logit } (p) = \beta' x$$

Thus, the probability of infection being greater than 50% or more (p) can be calculated by re-arranging this equation as follows:

$$p = \frac{\exp(\beta' x)}{1 + \exp(\beta' x)}$$

Table K.1 shows regression coefficients used to estimate probability of infection being greater 50% or more

Characteristic	Coefficient estimate (B)	Standard error of estimate	OR (95% CI)	p value
Ascaris lumbricoides				
Constant	28.992	0.248	-	-
Maximum LST	-0.127	3.942	0.88 (0.78-0.99)	0.047
Mean LST	0.113	4.019	1.12 (1.00-1.25)	0.045
Minimum NDVI	-0.020	4.747	0.98 (0.96-0.98)	0.029
Mean NDVI	0.026	5.819	1.03 (1.01-1.05)	0.016

Hence, our logistic regression model is:

$$\textbf{log odds of outcome} = \textbf{log}\left[\frac{\textbf{p}}{\textbf{1-P}}\right]$$

$$= 28.992 + -0.127*\text{maxlst} + 0.113*\text{meanlst} + -0.020*\text{minndvi} + 0.026*\text{meanndvi}$$

$$= \textbf{ß'x}$$

Which can be arranged as follows:

$$p = \frac{\textbf{exp (28.992 + -0.127*maxlst + 0.113*meanlst + -0.020*minndvi + 0.026*meanndvi}}{\textbf{1 + exp (28.992 + -0.127*maxlst + 0.113*meanlst + -0.020*minndvi + 0.026*meanndvi}}$$

Following this process, we can obtain a risk map of the predicted probability of *Ascaris lumbricoides* infection prevalence more than 50%.

APPENDIX L

Table L.1: Summary descriptive of the database on the prevalence of the STH infections in Malaysia

Year	State	District	Mukim	Stool	Number Positive			Percentage Positive (%)			Overall [a]	Reference
				Examined	*Asc*	*Tri*	Hook	*Asc*	*Tri*	Hook		
1968	Pahang	Rompin	Tioman	8	7	3	3	87.5	37.5	37.5	95.1	Heyneman et al, 1968
1968	Pahang	Rompin	Tioman	26	24	10	4	92.3	38.5	15.4	96.0	Heyneman et al, 1968
1968	Pahang	Rompin	Tioman	31	27	24	13	87.1	77.4	41.9	98.3	Heyneman et al, 1968
1970	Kuala Lumpur	Ulu Klang	Kuala Lumpur	183	91	150	62	50.0	82.0	34.0	94.1	Bisseru & Aziz, 1970
1970	Pahang	Bentong	Sabai	96	14	21	21	14.5	22.0	22.0	48.0	Bisseru & Aziz, 1970
1970	Selangor	Gombak	Setapak	100	69	80	51	69.0	80.0	51.0	97.0	Bisseru & Aziz, 1970
1970	Selangor	Kuala Selangor	Pasangan	138	118	121	20	85.5	87.5	14.5	98.5	Bisseru & Aziz, 1970
1970	Selangor	Petaling	Petaling	110	38	65	59	34.5	59.0	53.5	87.5	Bisseru & Aziz, 1970
1970	Selangor	Petaling (PJ)	Bandar PJ	151	23	36	2	15.2	23.8	1.3	36.2	Bisseru & Aziz, 1970
1971	Selangor	Ulu Langat	Ampang	57	47	48	29	82.0	84.0	33.0	98.1	Lie et al, 1971
1971	Selangor	Ulu Langat	Berenang	145	48	45	35	33.0	31.0	24.0	64.9	Lie et al, 1971
1972	Selangor	Gombak	Setapak	1273	498	728	874	39.1	57.2	68.7	91.8	Dunn, 1972
1977	Selangor	Gombak	Setapak	126	60	102	120	47.6	80.9	95.2	99.5	Dissanaike, 1977
1978	Penang	Barat daya	Mukim 11	127	99	80	14	77.8	63.0	11.0	92.7	Khairul Anwar et al, 1978
1978	Penang	Barat daya	Mukim 12	37	28	35	1	75.7	94.6	2.0	98.7	Khairul Anwar et al, 1978
1978	Penang	Barat daya	Mukim 13	41	20	10	1	48.8	24.4	2.4	62.2	Khairul Anwar et al, 1978
1978	Penang	Barat Daya	Mukim 2	163	99	77	17	60.7	47.2	10.4	81.4	Khairul Anwar et al, 1978
1978	Penang	Barat daya	Mukim 4	25	24	25	17	96.0	100.0	68.0	100.0	Khairul Anwar et al, 1978
1978	Penang	Barat daya	Mukim 8	20	10	9	2	50.0	45.1	10.0	75.3	Khairul Anwar et al, 1978
1978	Penang	Timur Laut	Mukim 17	20	11	4	1	55.0	20.0	5.0	65.8	Khairul Anwar et al, 1978
1978	Perak	Manjung	Pulau Pangkor	84	68	76	51	81.1	90.6	60.4	99.3	Nawalinski & Roundy, 1978
1978	Selangor	Klang	Klang	150	72	84	42	52.0	56.0	28.0	84.8	Sinniah et al, 1978
1979	Selangor	Kuala Langat	Tg. Dua Belas	834	723	705	360	86.7	84.5	43.2	98.8	Lo et al, 1979
1980	Malacca	Jasin	Jasin	562	84	104	156	15.0	18.5	27.8	50.0	Zahedi et al, 1980
1982	Kuala Lumpur	Batu	Batu	3162	357	866	38	11.3	27.4	1.2	36.4	Kan, 1982
1982	Kuala Lumpur	Kuala Lumpur	Bandaraya	2923	164	453	18	5.6	15.5	0.6	20.7	Kan, 1982
1982	Kuala Lumpur	Kuala Lumpur	Bandaraya	7682	1682	3419	353	21.9	44.5	4.6	58.6	Kan, 1982
1982	Kuala Lumpur	Kuala Lumpur	Kuala Lumpur	943	214	410	44	22.7	43.5	4.7	58.4	Kan, 1982
1982	Perak	Batang Padang	Ulu Bernam	1511	1103	833	341	73.0	55.1	22.6	90.6	Kan, 1982

[a] Overall combined prevalence of STH infections was calculated using a simple probability law according to de Silva & Hall (2010)

1982	Selangor	Ulu Selangor	Batang Kali	3402	1317	1902	364	38.7	55.9	10.7	75.9	Kan, 1982
1982	Selangor	Ulu Selangor	Kerling	1070	199	477	230	18.6	44.6	21.5	64.6	Kan, 1982
1982	Selangor	Ulu Langat	Ampang	858	149	298	36	17.4	34.7	4.2	48.3	Kan, 1982
1984	Kuala Lumpur	Bandar KL	Bandar KL	194	135	179	14	69.5	92.3	7.2	97.8	Kan, 1984
1984	Kuala Lumpur	Setapak	Setapak	122	86	107	2	70.5	87.7	1.6	96.4	Kan, 1984
1984	Kuala Lumpur	Setapak	Setapak	93	60	87	2	64.5	93.5	2.2	97.7	Kan, 1984
1984	Kuala Lumpur	Ulu Kelang	Kuala Lumpur	1888	597	761	202	31.6	40.3	10.7	63.5	Sinniah, 1984
1984	Selangor	Petaling	Petaling	162	75	138	66	46.3	85.2	40.7	95.3	Kan, 1984
1984	Selangor	Petaling	Damansara	43	7	43	16	16.3	100.0	37.2	100.0	Kan, 1984
1987	Selangor	Petaling	Sungai Buloh	1157	653	941	165	56.4	81.3	14.3	93.0	Kan & Poon, 1987
1989	N. Sembilan	Port Dickson	Port Dickson	819	278	298	128	33.9	36.4	15.6	64.5	Kan, 1989
1990	Kelantan	Kota Bahru	Badang	619	467	611	136	75.4	98.7	22.0	99.8	Li, 1990
1991	Selangor	Gombak	Setapak	9863	3255	4833	592	33.0	49.0	6.0	67.9	Hanjeet et al, 1991
1992	Kuala Lumpur	Ampang	Ampang	723	340	441	29	47.0	61.0	4.0	80.2	Chan et al, 1992
1994	Penang	Barat daya	Mukim 10	132	61	41	55	46.2	30.7	41.5	78.2	Rahman et al, 1998
1994	Penang	Barat daya	Mukim 12	92	32	34	34	34.5	36.7	37.0	73.9	Rahman et al, 1998
1994	Penang	Barat daya	Mukim B	105	39	31	36	36.7	29.5	34.2	70.6	Rahman et al, 1998
1994	Penang	Barat daya	Mukim C	173	78	67	54	45.2	38.7	31.0	76.8	Rahman et al, 1998
1994	Penang	Barat daya	Mukim E	204	79	63	55	38.8	30.7	26.8	69.0	Rahman et al, 1998
1994	Selangor	Gombak	Batu	456	36	215	13	7.9	47.1	2.9	52.7	Rajeswari et al, 1994
1995	Perak	Hulu Perak	Temenggor	25	5	6	4	20.0	24.0	16.0	48.9	Karim et al, 1995
1995	Selangor	Kuala Selangor	Tg. Karang	177	49	67	1	27.7	37.9	0.5	55.3	Oothuman et al, 1995
1997	Kelantan	Bachok	Tawang	105	50	55	17	47.6	52.4	16.2	79.1	Mahendra et al, 1997
1997	Kelantan	Gua Musang	Galas	84	50	35	5	59.5	41.7	6.0	77.8	Rahmah et al, 1997
1997	Kelantan	Kota Bahru	Panji	144	23	48	1	16.0	33.3	0.7	44.4	Mahendra et al, 1997
1997	Selangor	Sepang	Dengkil	205	129	188	59	62.9	91.7	28.8	97.8	Norhayati et al, 1997
1998	Perak	Kuala Kangsar	Sungai Siput	0	0	0	0	17.0	29.0	24.0	55.2	Norhayati et al, 1998
1999	Kelantan	Gua Musang	Bertam	268	118	80	17	43.9	29.7	6.3	63.0	Zukifli et al, 1999
2002	Selangor	Ulu Langat	Ulu Langat	159	60	86	70	33.3	55.3	44.7	83.5	Ghani et al, 2002
2004	Pahang	Lipis	Batu Yon	79	20	25	6	25.7	31.1	8.1	53.0	Al-Mekhlafi et al, 2005
2005	Selangor	Ulu Selangor	Peretak	281	174	276	104	61.9	98.2	37.0	99.6	Al-Mekhlafi et al, 2005
2007	Pahang	Lipis	Ulu Jelai	292	198	279	39	67.8	95.5	13.4	98.7	Al-Mekhlafi et al, 2007
2010	Johor	Kota Tinggi	Tanjung Surat	89	0	3	1	0.0	3.4	1.1	4.5	Conducted in the present study
2010	Kelantan	Gua Musang	Bertam	77	55	61	18	71.4	79.2	23.4	95.4	Conducted in the present study
2010	Pahang	Bera	Bera	113	41	62	16	36.3	59.9	14.2	78.1	Conducted in the present study

2010	Pahang	Lipis	Ulu Jelai	92	53	87	9	57.6	94.6	9.8	97.9	Conducted in the present study
2010	Pahang	Rompin	Keratong	99	26	59	11	26.3	60.0	11.1	73.8	Conducted in the present study
2010	Perak	Perak Tengah	Belanja	86	18	73	9	20.9	84.9	10.5	89.3	Conducted in the present study
2010	Selangor	Gombak	Batu	195	63	148	36	32.3	75.9	18.5	86.7	Conducted in the present study
2010	Selangor	Ulu Selangor	Ulu Yam	45	18	34	11	40.0	75.6	24.4	88.9	Conducted in the present study
2010	Selangor	Kuala Langat	Jugra	115	65	99	17	56.5	86.1	14.8	94.8	Conducted in the present study
2011	Pahang	Bentong	Bentong	30	0	3	0	0.0	10.0	0.0	10.0	Conducted in the present study
2011	Pahang	Jerantut	Ulu Tembeling	83	14	51	3	16.7	61.4	3.6	69.0	Conducted in the present study
2011	Pahang	Lipis	Ulu Jelai	29	9	21	4	31.0	72.4	13.8	83.6	Nasr et al, 2013
2011	Pahang	Lipis	Telang	47	22	28	17	46.8	59.6	29.8	84.9	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	53	34	35	12	64.2	66.0	22.6	90.6	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	69	31	60	11	44.9	86.9	15.9	93.9	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	26	14	24	6	53.8	53.8	23.1	83.6	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	24	13	21	6	54.2	87.5	25.0	95.7	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	14	10	11	2	71.4	78.6	14.3	94.8	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	30	8	18	10	26.7	60.0	33.3	80.4	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	39	8	32	5	20.5	82.1	12.8	87.6	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	17	5	13	4	29.4	76.5	23.5	87.3	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	41	13	25	4	31.7	61.0	9.8	76.0	Nasr et al, 2013
2011	Pahang	Lipis	Ulu Jelai	12	0	8	1	0.0	66.7	8.3	69.5	Nasr et al, 2013
2011	Pahang	Raub	Batu Talam	254	214	121	10	84.6	47.6	3.9	92.2	Ahmed et al, 2011
2011	Perak	Ulu Perak	Lenggong	98	39	35	8	39.8	35.7	8.2	64.5	Conducted in the present study
2011	Selangor	Ulu Klang	Gombak	54	25	40	0	46.3	74.1	0.0	86.1	Conducted in the present study
2011	Selangor	Ulu Langat	Ulu Langat	54	14	29	5	25.9	53.7	9.3	68.9	Conducted in the present study
2011	Selangor	Ulu Langat	Ulu Semenyih	33	4	8	0	12.1	24.2	0.0	33.4	Conducted in the present study
2012	Kedah	Baling	Siong	67	39	42	11	58.2	62.7	16.4	87.0	Conducted in the present study
2012	Kedah	Sik	Sik	48	1	0	0	2.1	0.0	0.0	2.1	Conducted in the present study
2012	Malacca	Alor Gajah	Pulau Sebang	10	0	4	0	0.0	0.4	0.0	0.4	Conducted in the present study
2012	Malacca	Alor Gajah	Taboh Naning	55	18	32	0	58.2	58.2	32.7	88.2	Conducted in the present study
2012	N. Sembilan	Jelebu	Kenaboi	109	38	81	16	34.9	74.3	14.7	85.7	Conducted in the present study
2012	N. Sembilan	Jelebu	K. Kelawang	45	17	9	2	37.8	20.0	4.4	52.4	Conducted in the present study
2012	Pahang	Temerloh	Jenderak	16	9	9	4	56.3	56.6	25.0	85.8	Conducted in the present study
2012	Pahang	Temerloh	Lipat Kajang	51	34	30	8	66.7	58.8	15.7	88.4	Conducted in the present study
2012	Perak	Manjung	Lumut	28	1	1	0	3.5	3.5	0.0	6.9	Conducted in the present study
2012	Selangor	Ulu Langat	Semenyih	49	28	38	0	57.1	77.6	0.0	90.4	Conducted in the present study

APPENDIX M

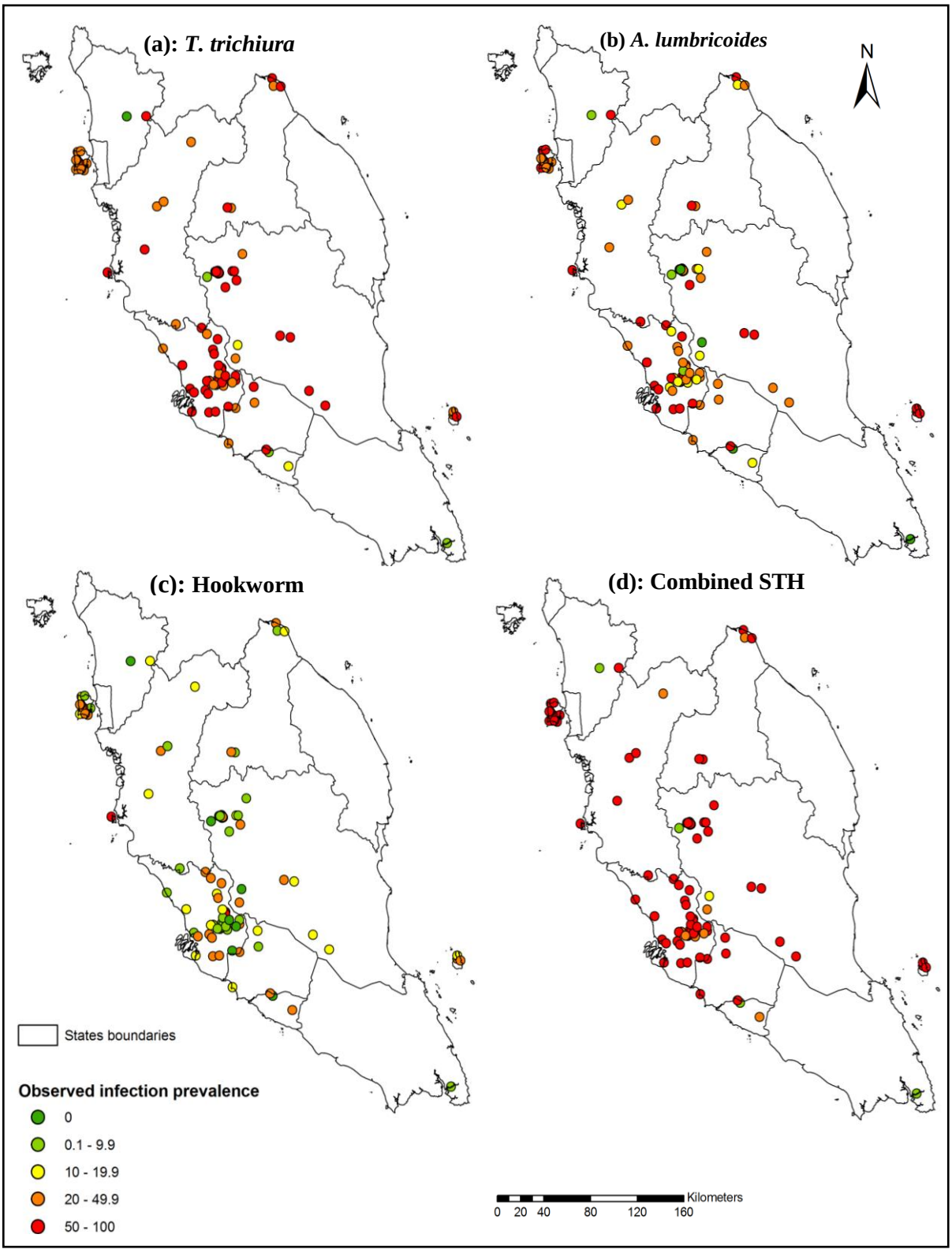

Figure M.1 (a) - (d): Maps of the actual geo-positioned location distribution of STH species, i.e., (a) *T. trichiura*, (b) *A. lumbricoides*, (c) hookworm, (d) combined STH at sub-district level in Peninsular Malaysia (1970-2012) from available survey data. White indicates areas no relevant data were located at present

APPENDIX N

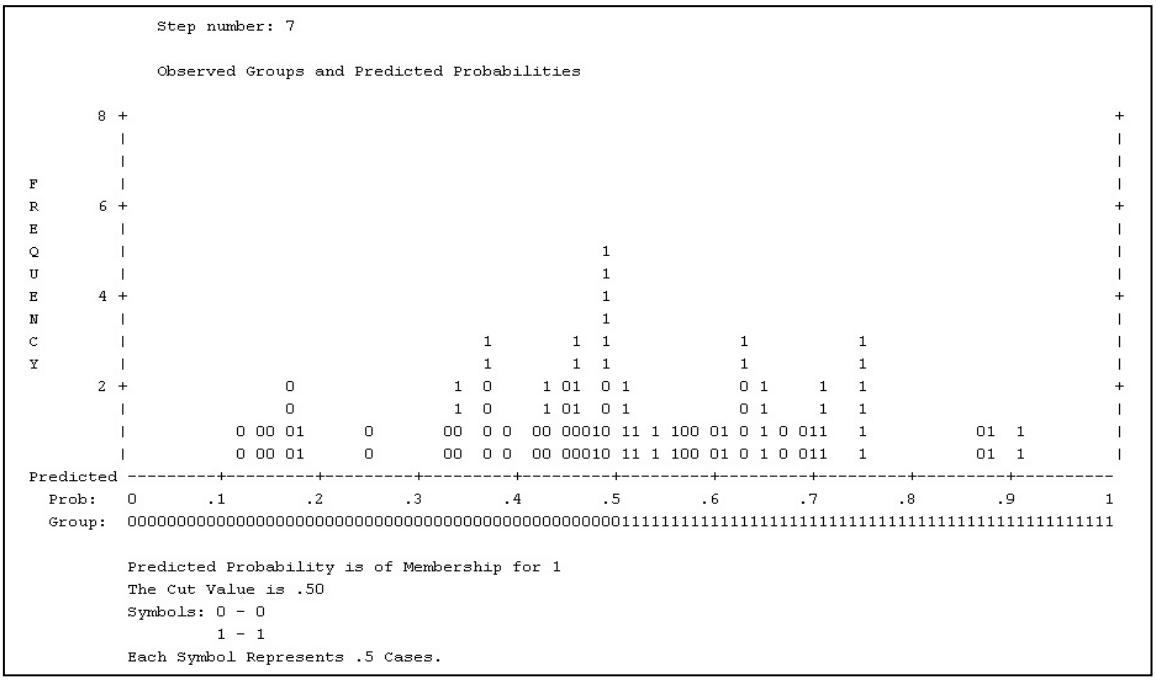

Figure N.1: Plot of the model accuracy to predict areas with (denoted as 1) and without infections (denoted as 0)

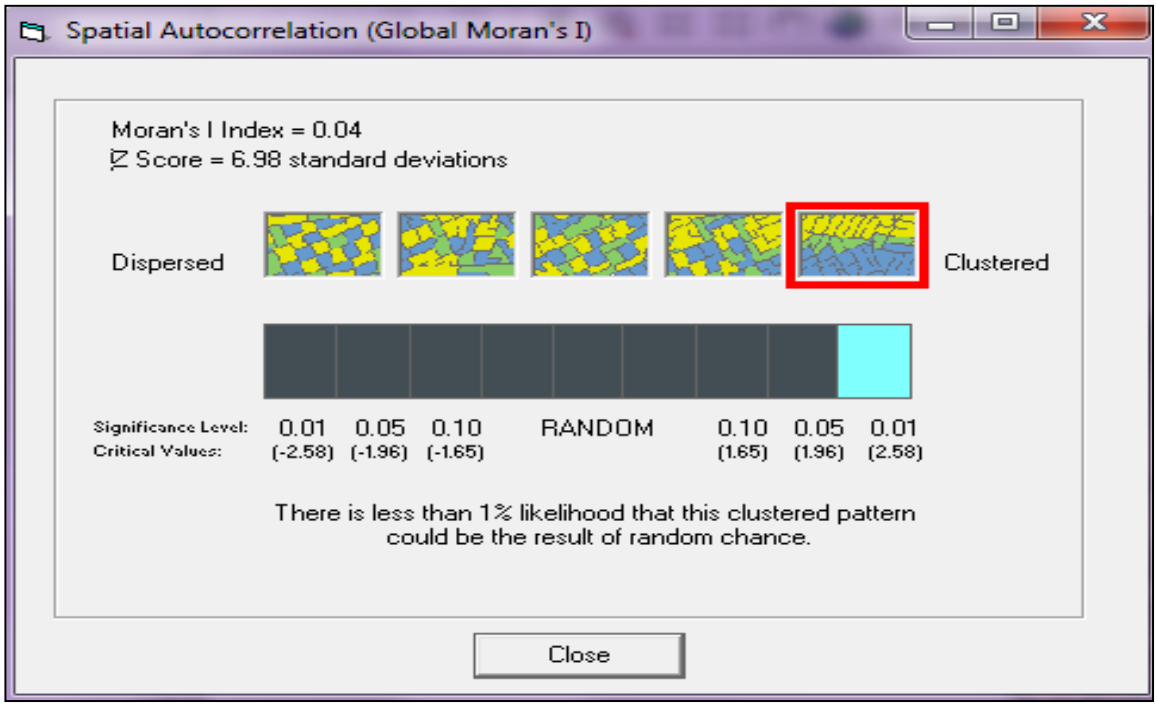

Figure N.2: Result of *Moran's I* for distribution of *A. lumbricoides* as assessed using ArcGIS 9.3 software (ERSI, Redlands, CA, USA)

APPENDIX O

Table O.1: Summary estimates of predicted prevalence, number being infected (total population and school-aged children) and number warranting mass treatment using 50% and 20% threshold at district level

State	District	Total population 2010	Total number of school-age children	Estimated prevalence of *Ascaris* [a]	Estimated total number infected with *Ascaris*	Estimated total number of school-age children infected with *Ascaris*	Estimated number receiving treatment using 50% threshold	Estimated number receiving treatment using 20% threshold
JOHOR	Batu Pahat	377199	80304	27.3	44742	9708	2645	3132
	Johor Bahru	1003036	207073	7.4	28654	6279		892
	Kluang	254077	52317	25.9	94204	19392	5386	18891
	Kota Tinggi	171356	35480	18.3	23600	5094	3492	3492
	Mersing	112483	25867	20.1	6695	1453	251	785
	Muar	291334	62601	17.4	78561	16782	11795	13056
	Pontian	189880	42356	8.3	18662	4169		1465
	Segamat	181072	36029	13.7	25992	4890		2411
	State Total	**2,580,437**	**542,027**	**29.0**	**321,110**	**67,767**	**23,569**	**44,124**
KEDAH	Baling	142057	92992	38.5	61617	12168	20559	23885
	Bandar Baharu	40677	9389	47.0	20955	4860	4041	4331
	Kota Setar	340999	66258	15.6	40671	7972	3636	6155
	Kuala Muda	424913	93011	26.1	147861	32750	30120	30964
	Kubang Pasu	208060	39595	24.6	52136	9862	3797	7972
	Kulim	278002	62637	44.0	111750	24689	16606	22501
	Langkawi	83607	18902	29.2	18373	4555	3221	3853
	Padang Terap	60413	13185	34.1	22123	4793	3994	4388
	Pendang	92669	19713	32.1	26448	5613	2625	3733
	Sik	64795	14676	81.7	49824	11314	11314	11314
	Yan	65950	14643	27.8	20855	4584		4289
	State Total	**1,802,142**	**445,001**	**50.6**	**572,613**	**123,160**	**99,913**	**123,385**

State	District	Total population 2010	Total number of school-age children	Estimated prevalence of *Ascaris* [a]	Estimated total number infected with *Ascaris*	Estimated total number of school-age children infected with *Ascaris*	Estimated number receiving treatment using 50% threshold	Estimated number receiving treatment using 20% threshold
KELANTAN	Bachok	41672	10228	41.0	12351	2941	1362	2032
	Gua Musang	9171	2342	63.9	5609	1452	1089	1452
	Jeli	17082	4375	126.6	11116	2972	2757	2757
	Kota Bahru	1137947	28343	9.7	13108	2692		1928
	Kuala Krai	19117	4928	76.4	16396	4224	4224	4224
	Machang	30298	5519	35.2	8988	1732	1326	1681
	Pasir Puteh	84505	20667	30.6	28631	6865	2404	5938
	Tanah Merah	12158	3097	49.5	7323	1896	1896	1896
	Tumpat	85386	17590	13.0	9163	1874		133
	State Total	**1,437,336**	**97,089**	**52.3**	**112,685**	**26,648**	**15,058**	**22,041**
KUALA LUMPUR	**State Total**	**1,947,398**	**316,454**	**10.3**	**139,443**	**23,515**	**0**	**0**
MELAKA	Alor Gajah	171367	32662	26.6	46633	8958	5101	7593
	Jasin	133468	27522	37.5	50486	10112	5072	9681
	Melaka Tengah	458641	84708	26.9	96925	19039	7818	15192
	State Total	**763,476**	**144,892**	**47.1**	**194,044**	**38,109**	**17,991**	**32,466**
NEGERI	Jelebu	40230	7593	21.1	6182	1222		424
SEMBILAN	Jempol	88109	17529	29.9	47865	9399	8244	8434
	Kuala Pilah	83654	16381	22.1	18833	3942	2988	2988
	Port Dickson	88722	19634	21.3	5118	1060	880	894
	Rembau	204890	41398	29.5	37252	7445	3717	5231
	Seremban	329044	66408	6.3	19905	3939		
	Tampin	101834	19980	23.6	12546	2451	404	1153
	State Total	**936,483**	**188,923**	**39.8**	**147,701**	**29,458**	**16,233**	**19,548**

State	District	Total population 2010	Total number of school-age children	Estimated prevalence of *Ascaris* [a]	Estimated total number infected with *Ascaris*	Estimated total number of school-age children infected with *Ascaris*	Estimated number receiving treatment using 50% threshold	Estimated number receiving treatment using 20% threshold
PAHANG	Bentong	107940	20431	13.0	19971	3559		3138
	Bera	36475	8013	34.5	18393	4037		3954
	Cameron Highland	32155	7728	9.6	3922	983		974
	Jerantut	82873	18579	47.0	30209	6756	3395	5115
	Kuantan	377536	74447	19.5	105177	20632		20160
	Lipis	80794	19696	57.6	46982	11267	8188	10688
	Maran	106916	21098	72.7	96073	18829	18027	18829
	Pekan	102667	23157	19.5	23453	5343		5054
	Raub	88469	18890	32.1	23092	4979	937	4913
	Rompin	100979	23192	28.0	26480	6391	3353	4329
	Temerloh	151287	33881	40.1	60048	13651	9212	13368
	State Total	**1,268,091**	**269,112**	**55.8**	**453,800**	**96,427**	**43,112**	**90,522**
PERAK	Batang Padang	168039	33434	27.4	46727	10036	4256	9023
	Hilir Perak	192801	41212	16.7	21576	4586	2201	2201
	Kerian	173989	39843	26.7	39160	9156	2355	7149
	Kinta	786123	140198	15.6	30817	6120	4117	5241
	Kuala Kangsar	152446	31804	50.0	77403	16082	12540	15138
	Larut dan Matang	319446	71021	35.1	71150	16486	5994	10848
	Manjung (Dinding)	219349	46523	10.2	18571	3924		575
	Perak Tengah	183632	36999	31.2	35343	7434	1156	3153
	Ulu Perak	87796	20642	57.4	56517	12894	11992	12657
	State Total	**2,283,621**	**461,676**	**48.2**	**397,264**	**86,718**	**44,611**	**65,985**

State	District	Total population 2010	Total number of school-age children	Estimated prevalence of *Ascaris* [a]	Estimated total number infected with *Ascaris*	Estimated total number of school-age children infected with *Ascaris*	Estimated number receiving treatment using 50% threshold	Estimated number receiving treatment using 20% threshold
PERLIS	**State Total**	**208,015**	**38,171**	**9.2**	**17,143**	**3,243**	**0**	**1,136**
PULAU	Barat Daya	187044	33083	28.7	30973	5664	3979	4610
PINANG	Seberang Perai Tengah	319639	60195	25.6	58063	10614	5236	9538
	Seberang Perai Selatan	293810	50299	34.9	123668	21472	19961	19961
	Seberang Perai Utara	158741	33372	19.4	21369	4649	2855	3608
	Timur Laut	479319	64716	50.7	51535	6794	6672	6672
	State Total	**1,438,553**	**241,665**	**47.8**	**285,608**	**49,193**	**38,703**	**44,389**
SELANGOR	Gombak	617637	116033	12.0	71598	12208		11256
	Klang	767140	149973	7.2	21132	3991		
	Kuala Langat	203686	43714	18.6	25236	5342	418	418
	Kuala Selangor	195614	40062	19.2	37203	7380		6333
	Petaling	1332965	207589	16.8	74702	11429		10781
	Sabak Bernam	101129	22319	10.7	10782	2435		
	Sepang	187413	37377	38.7	29308	6073	4895	5450
	Ulu Selangor	186250	42134	26.6	97528	22980	17120	21908
	State Total	**5,246,938**	**5,247,916**	**17.5**	**383,161**	**75,710**	**22,433**	**56,146**

State	District	Total population 2010	Total number of school-age children	Estimated prevalence of *Ascaris* [a]	Estimated total number infected with *Ascaris*	Estimated total number of school-age children infected with *Ascaris*	Estimated number receiving treatment using 50% threshold	Estimated number receiving treatment using 20% threshold
TERENGGANU	Besut	119041	29919	28.1	32893	8374	5104	6057
	Dungun	147319	34576	59.6	104108	24190	22122	24190
	Hulu Terengganu	68717	15617	30.2	25465	5992	2123	5469
	Kemaman	161959	39015	22.7	31558	7263	3649	3649
	Kuala Terengganu	333227	71611	25.8	80202	17099	6968	15070
	Marang	93851	22270	43.8	39023	9152	6303	7414
	Setiu	53470	13632	33.5	16581	4172	1096	4071
	State Total	**977,584**	**226,640**	**56.8**	**329,830**	**76,242**	**47,365**	**65,920**
COUNTRY TOTAL		**20,062,522**	**3,776,360**	**38.7**	**3,506,186**	**728,360**	**391,232**	**587,482**

[a] The estimated prevalence of *A. lumbricoides* for each district and state was calculated by taking the mean (i.e., average) of estimated prevalence of *A. lumbricoides* for each sub-district *(mukim*) in the respective district and state