Big Data in Asia Pacific – Opportunities with cross country data-base analyses

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Quality Use of Medicines and Pharmacy Research Centre

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The Asian Pharmacoepidemiology Network
http://aspennet.asia/aboutus.html

- Australia; University of South Australia
- China; Peking University Health Science Center
- Hong Kong; University of Hong Kong
- Japan: Nihon University; Tokyo University of Science
- Korea: Seoul National University
- Singapore; National University of Singapore
- Taiwan; National Cheng Kung University
- Thailand; Ubon Ratchathani University

  - Building research and collaboration across the region

AsPEN

Datasets in AsPEN

Country	Data source	Population (N) (millions)
Australia	Drug Utilisation Subcommittee dataset	23
Australia (DVA)	Department of Veterans' Affairs	.3
Hong Kong	Clinical Data Analysis and Reporting System	7
Korea	Health Insurance Review and Assessment Service	50
Taiwan	National Health Insurance Research Database	23
Japan I	Medical Data Center database	.33
Japan II	Hamamatsu University hospital database	.175

Common data

- Data sets available include electronic health records and administrative health claims data
- All participants have data on medicine
- All countries have diagnostic data in hospital data sets, some have outpatients
- All countries except Japan using ATC coding
- All countries using ICD 9 or ICD 10 coding
- Big challenge
  - Different medicines are available across all countries

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Databases in the Asia-Pacific Region
The Potential for a Distributed Network Approach

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TABLE 3. Detailed Information on Medications, Diagnoses, Procedures, and Health Expenditures in Participating Databases

Source Type	Claims Database				Electronic Health Record					Registry	
Data Component/Database	NDB	HIRA	NHIRD	JMDC	CDARS	NEHR	BHD	HI	HIS-WCH	TSR	TCR
Drug information											
Domestic coding system	∘	∘	∘	∘	∘	∘	∘	∘	∘		
International coding system	ATC[a]	ATC[a]	ATC[a]	ATC[a]	BNF			ATC			
Prescription place of service		∘	∘		∘	∘	∘	∘	∘		
Prescription date	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘[b]	∘[c]
Dispensing pharmacist		∘	∘			∘		∘	∘		
Dispensing date	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘[b]	
Drug supply day	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘[b]	
Quantity	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘[b]	
Route or drug administration	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘[b]	
Dose strength	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘[b]	
Usage frequency	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘[b]	
Specific indication						∘	∘		∘	∘[b]	
Reason for discontinuation						∘		∘		∘[b]	
Diagnosis information											
Domestic coding system					∘					∘	
International coding system	ICD-10	ICD-10	ICD-9	ICD-10	ICD-9/ICD-10	ICD-10	ICD-10	ICD-10	ICD-10	ICD-9	ICD-9
Diagnosis start date	∘	∘	∘	∘	∘		∘	∘		∘	∘

How we work: distributed network model
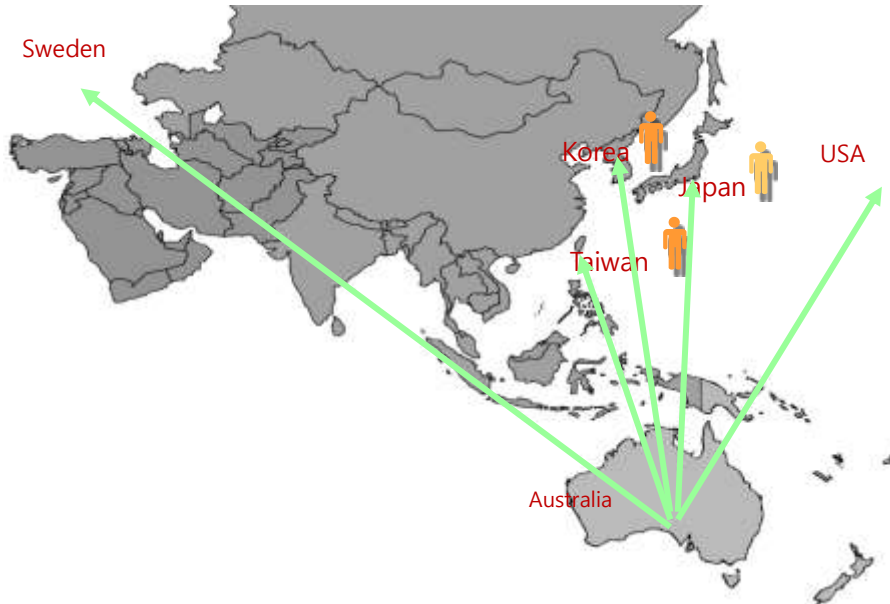
How we work:
Distributed Network Model

- Common SAS code with global Macro variables
  - %let patientid=XXXXXXX;
  - %let medcde=XXXXXXX;
  - %let atccde=XXXXXXX;
  - %let supplydt=XXXXXXX;
  - %let country=JAPAN;
  - %let datea='01JAN1999'd;
  - %let dateb='31DEC2009'd;
- Macros
  - **%macro** wt(atc,x,include,exclude,label);
  - **%macro** pssa(atc1,atc2,days,label1,label2);

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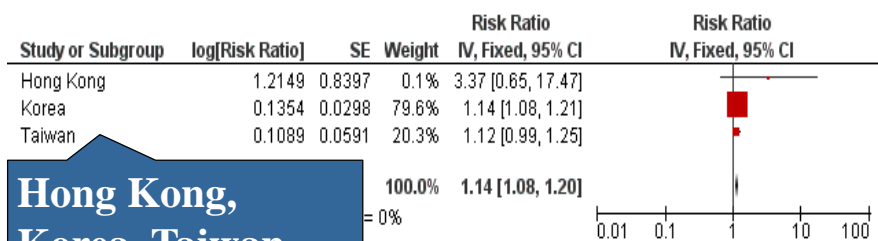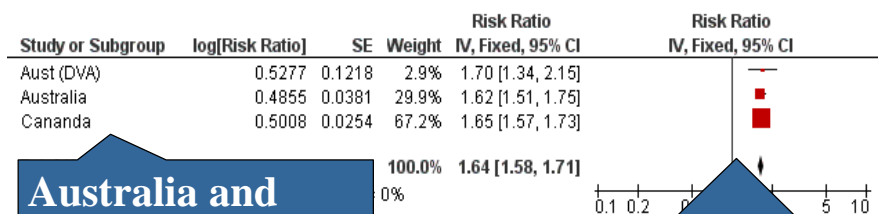University of South Australia

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Opportunities

- Compare utilisation of medicines across countries
- Undertake safety studies
- Identify differences in the safety profile of medicines across countries
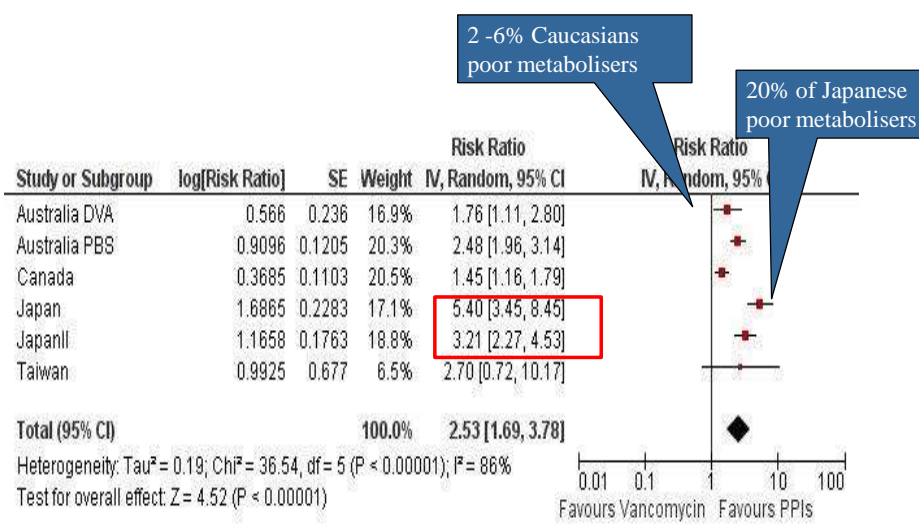 - Particularly where frequently occurring pharmacogenetic differences may affect side effects

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Rosiglitazone and heart failure risk

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Fixed, 95% CI
Hong Kong	1.2149	0.8397	0.1%	3.37 [0.65, 17.47]
Korea	0.1354	0.0298	79.6%	1.14 [1.08, 1.21]
Taiwan	0.1089	0.0591	20.3%	1.12 [0.99, 1.25]
			100.0%	1.14 [1.08, 1.20]

Hong Kong, Korea, Taiwan

$I^2 = 0\%$

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Fixed, 95% CI
Aust (DVA)	0.5277	0.1218	2.9%	1.70 [1.34, 2.15]
Australia	0.4855	0.0381	29.9%	1.62 [1.51, 1.75]
Cananda	0.5008	0.0254	67.2%	1.65 [1.57, 1.73]
			100.0%	1.64 [1.58, 1.71]

Australia and Canada

$I^2 = 0\%$

ADIPOQ C-11377 CC genotype more common
CYP2C9*1 genotype less common than in Asian pop'ns

Risk of clostridium difficile infections with proton pump inhibitors

2 -6% Caucasians poor metabolisers

20% of Japanese poor metabolisers

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Random, 95% CI
Australia DVA	0.566	0.236	16.9%	1.76 [1.11, 2.80]
Australia PBS	0.9096	0.1205	20.3%	2.48 [1.96, 3.14]
Canada	0.3685	0.1103	20.5%	1.45 [1.16, 1.79]
Japan	1.6865	0.2283	17.1%	5.40 [3.45, 8.45]
JapanII	1.1658	0.1763	18.8%	3.21 [2.27, 4.53]
Taiwan	0.9925	0.677	6.5%	2.70 [0.72, 10.17]
Total (95% CI)			100.0%	2.53 [1.69, 3.78]

Heterogeneity: Tau² = 0.19; Chi² = 36.54, df = 5 (P < 0.00001); I²= 86%
Test for overall effect: Z = 4.52 (P < 0.00001)

Favours Vancomycin   Favours PPIs
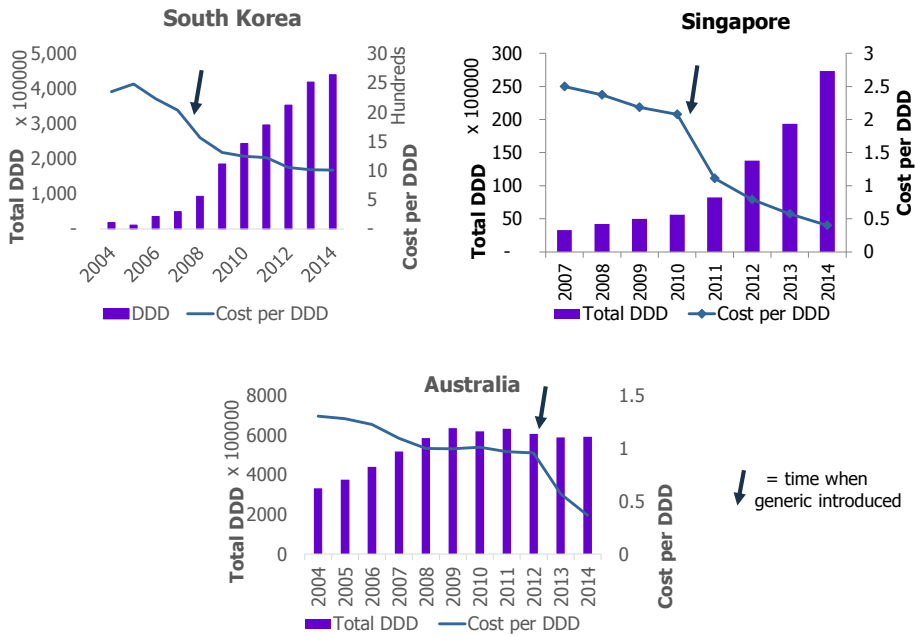
Other opportunities with big data

- Universal Health Care – Access to Medicines Network
  - An initiative supported by the Western Pacific Regional Office of the World Health Organization
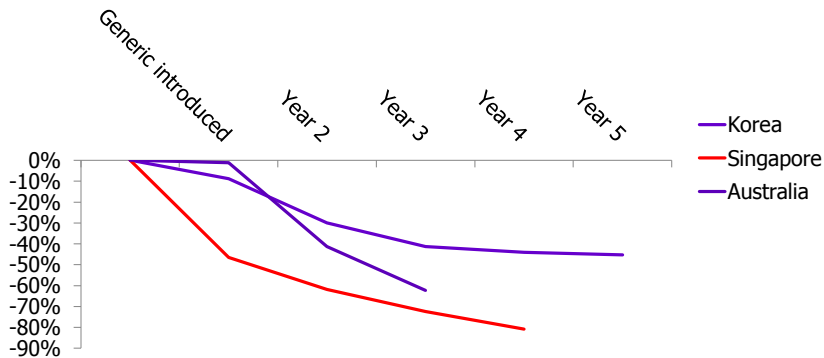- Using big data to examine differences in policy implementation across countries

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Comparing generic pricing policy

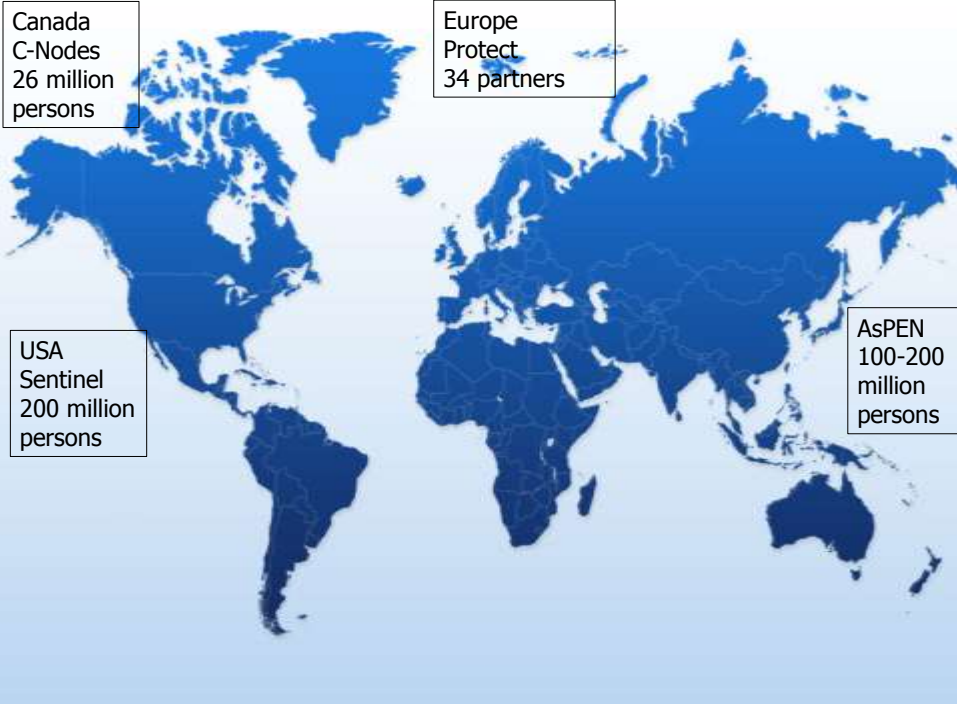| Australia	South Korea	Singapore
Reference pricing and mandatory price reduction when first generic enters market	Reference pricing and mandatory price reduction when first generic enters market	No regulation on drug prices. Tender process by the SingHealth Group Procurement Office
• Mandatory 16% reduction in price. Subsequent reductions in price are based on a price disclosure policy. • Companies must disclose sales revenue, sales volume and the value of incentives or discounts. This is used to determine a weighted average disclosed price (WADP)	First year after patent expiry: • 30% reduction in the price of originator. Second year after patent expiry: • 53.5% of originator price for all generic medicines and original drug,	

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South Korea

Singapore

Australia

↓ = time when generic introduced

South Korea data: HIRA. Singapore data: IMS Health Plus. Australia: Australian statistics on medicines

Cumulative price reduction from year generic introduced

Korea
Singapore
Australia

(year of generic introduction is the reference year)

The global potential

Canada
C-Nodes
26 million
persons

Europe
Protect
34 partners
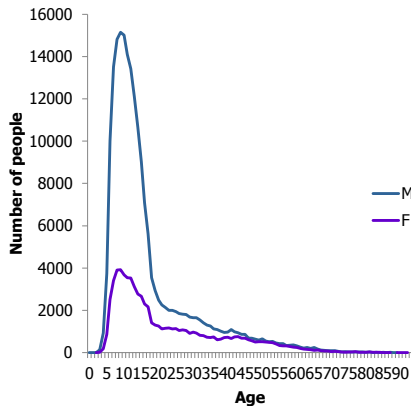
USA
Sentinel
200 million
persons

AsPEN
100-200
million
persons

Current work: medicine utilisation study for ADHD medicines

Medicines for ADHD by age: Australia 2014

17 participating countries

Hong Kong	Iceland
Netherlands	Spain
Italy	France
UK	Japan
Sweden	Taiwan
Denmark	Korea
Finland	Australia
Norway	USA
	Canada

Why might global networks be necessary

- New drug development becoming increasingly specialised with many treatments for rare diseases
- Challenge, we are once again seeing medicines registered for market on phase II evidence (no randomised controlled trials)
- Single country data sources will not be sufficient to assess this post-market

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Conclusions

- Significant opportunity to use electronic health claims data to inform and improve health care
- Significant opportunities for collaboration across the Asia Pacific region and beyond to support health care improvement and further build the research network

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