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Breast and Cervical Cancer Screening in Singapore – reaching the 'right women'

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AIM

The primary aim of this paper is to ascertain if there are regional differences in screening patterns for breast and cervical cancers in Singapore and to utilise these results to develop more targeted communications and marketing strategies with a view to increasing screening coverage.

A secondary aim is to ascertain if there are regional differences in assessment rates – i.e. attendance at assessment centres following an abnormal screening result.

BACKGROUND

Cancer is the leading cause of death in Singapore, and is responsible for 1 in 4 deaths here. (*Source: Ministry of Health Statistics 2006*). Among Singaporean women, breast cancer is the most common cancer with an incidence of 54.9 per 100,000, while cervical cancer is the sixth most common cancer, with an incidence of 10.6 per 100,000 *(Source: Singapore Cancer Registry, 1968 – 2002)*.

To reduce the incidence and mortality from breast and cervical cancer, Health Promotion Board (HPB) introduced two population-based screening programmes, BreastScreen Singapore and CervicalScreen Singapore in January 2002 and in August 2004 respectively. BreastScreen Singapore encourages women aged 50 and older to go for screening mammograms once every two years, while CervicalScreen Singapore encourages women aged 25 and older to go a Pap smear screening once every 3 years. Both programmes offer affordable and accessible screening as women may choose to get screened at a subsidised rate at any of the conveniently located polyclinics. In addition, both programmes emphasise quality and have instituted robust quality assurance frameworks and quality improvement processes. Performance indicators are benchmarked against more established population-based breast and cervical cancer screening programmes, such as those in Australia and the United Kingdom.

While data was obtained for both CervicalScreen Singapore and BreastScreen Singapore, the data and analysis discussed in this paper will refer only to BreastScreen Singapore to avoid repetition.

BREASTSCREEN SINGAPORE (BSS)

The age-standardised incidence rate of breast cancer in Singapore has doubled over the past 30 years (from 20.0 per 100,000 in 1968-72 to 56.3 per 100,000 in 2003-2007) and about 6,773 women in Singapore were diagnosed with breast cancer from 2003 - 2007.

Research has shown that a high quality, well-organised population-based screening programme can reduce the mortality rate from breast cancer by 25 to 30%, if the programme is able to regularly screen 70% of women aged 50-69 years. The Health Promotion Board (HPB) introduced the National Breast Cancer Screening Programme, BreastScreen Singapore (BSS), in January 2002. The programme encourages women aged 50 years and older to go for screening mammography once every 2 years. To facilitate the process, invitation letters are sent to women aged 50 – 69 years, encouraging them to go for screening every 2 years. Informational material on breast cancer screening is included with the letter, and women may choose to go for screening at the polyclinics, at restructured hospitals or at private x-ray centres.

Subsidised screening is available at 15 polyclinics, where Singaporean women pay $50 for the test (actual cost of test is $105). Women with abnormal screening results are referred for further assessment at an assessment centre located at one of 3 restructured hospitals.

Information of women attending screening at the polyclinics is available in a central database managed by HPB. The HPB database, however, does not have information of women screened at centres other than the polyclinics, and information of national breast cancer screening coverage is obtained via the National Health Surveys and the National Health Surveillance Surveys conducted regularly by the Ministry of Health, Singapore.

While the knowledge of screening mammography is high (about 80% of the target population know about a mammogram), only 41% have had a screening mammogram in the preceding 2 years *(Source: National Health Surveillance Survey 2007*).

To narrow the knowledge-practice gap, HPB is exploring novel approaches to reach women who have not have been screened as well as those who do not go for regular screening. HPB, together with the Singapore Land Authority (SLA), embarked on this project to use Geographical Information Software (GIS) to determine if there are regional differences in the uptake of breast cancer screening.

METHODOLOGY

1. Data of all women eligible for breast cancer screening (i.e. those aged 50 to 69 years) was obtained from the Ministry of Home Affairs (MHA). The information obtained included:

a. Age
b. Ethnic group
c. Postal code, road/street name, block/house number

2. Next, information on women aged 50 – 69 years who had been screened at least once under the subsidised programme from January 2002 to April 2009 was obtained from the BreastScreen Singapore database. This dataset was, logically, a subset of the dataset of all eligible women described in para 1. Information on attendance at assessment, for those with abnormal screening results, was also obtained from the BreastScreen Singapore database.

3. Address information of the screening and assessment centres was obtained from HPB.

4. Singapore was divided into 5 regions, Central, East, North, North-East and West, based on information from SLA which is the custodian of the Land Information Network Infrastructure (LandNet), a national infrastructure that facilitates government and private agencies on-line exchange and access to land data and value added geographical information services across a heterogeneous Geographical Information System (GIS) environment.

5. The address information was used to obtain information on proximity of each eligible woman to the screening (and assessment) centres, as well as to determine the region the individual belonged to.

6. In addition, information on annual property value and sold unit addresses was used to determine socio-economic status, (Source: Inland Revenue Authority of Singapore (IRAS) and Housing Development Board (HDB).

7. The Geographical Information System (GIS) was then used to geocode the above data sets – on eligible women, those who attended screening (and assessment) and the location of the screening an assessment centres.

8. For screening, analysis was done to ascertain if there were regional differences in:

a) Overall screening rate
b) Screening rates depending on the proximity to the screening centres
c) Screening rates depending on the higher socio-economic status (using housing type as a proxy)
d) Screening rate of women 50 – 59 years and that of women 60 – 69 years
e) Screening rates of the different ethnic groups

9. For the assessment attendance, analysis was done to ascertain if there were regional differences in:

a) Proportion referred for assessment who attended assessment (assessment attendance rate)
b) Assessment attendance rates depending on the proximity to assessment centres (<1 km vs >5 km)
c) Assessment attendance rate depending on the socio-economic status (using housing type as proxy)

RESULTS

I. Screening

1. Overall screening rate

In total, 87,654 women aged 50 to 69 years attended for subsidised mammography screening at the polyclinics from January 2002 to April 2009. Screening uptake was found to be lowest in the Central and East regions where 18-19% of the eligible population attended screening, and fairly similar in the other three regions where 21-22% of the eligible population attended screening.

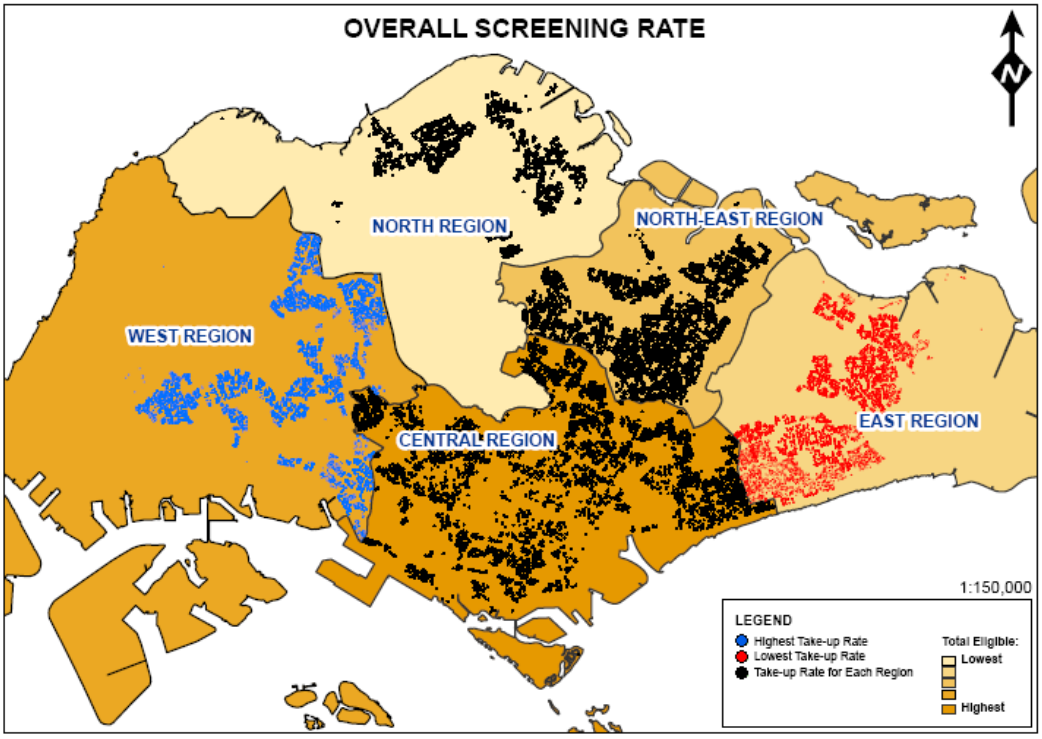

Diagram 1: Overall screening rate

2. Screening rates and proximity to screening centres

Of the women who attended screening at the polyclinics, almost all resided within 3 kilometres (km) of the polyclinics in the East and North-East regions, while only 80% of those who attended screening in the Northern region resided within 3km of the polyclinics.

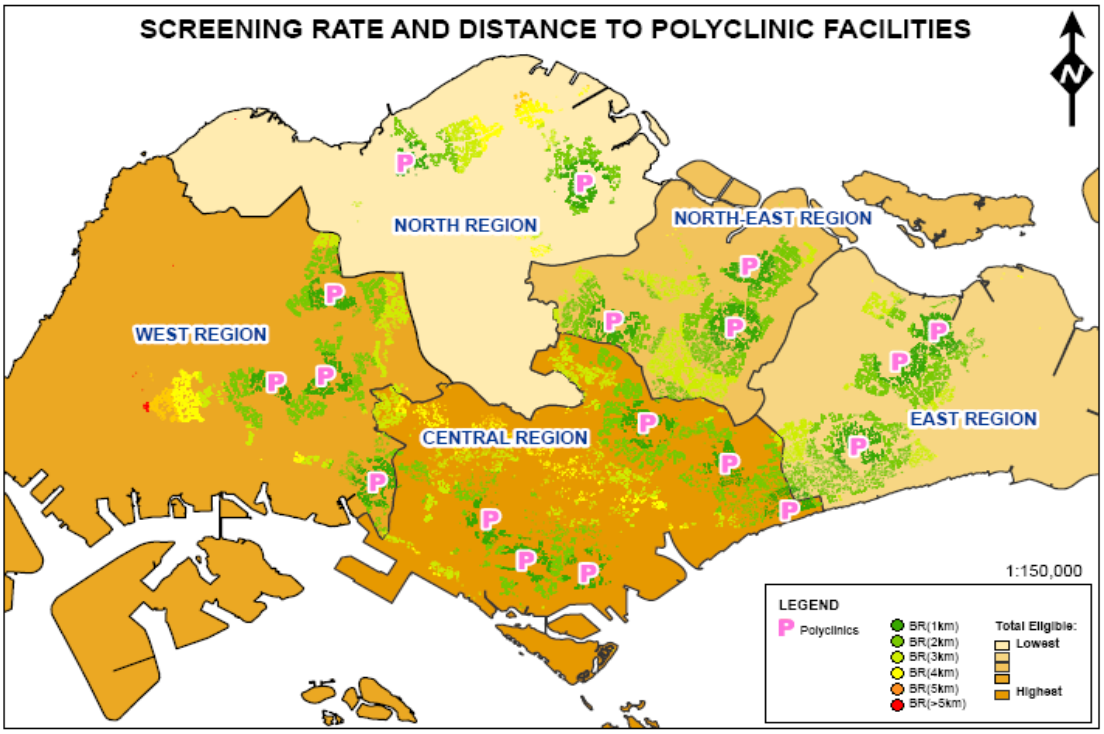

Diagram 2: Screening rate and distance to polyclinic screening facilities

3. Screening rates and socio-economic status

Of the total number of women eligible for screening, the proportion of women from the lower socio-economic group (using housing type of 3-room HDB flat and smaller as a proxy), ranged from 12% to 26% across the 5 regions, with the Central region having the highest proportion (26%) of eligible women in the lower socio-economic group and the East region having the lowest (12%).

The proportion of women who were screened and from the lower socio-economic group (using housing type of 3-room HDB flat and smaller as a proxy) was lowest in the East region (about 14% of all women screened), and highest in the North region (slightly more than half of all women screened). The proportions for the other regions ranged from 24 to 27%, with the proportion in the North region being 20%.

In contrast to the earlier finding where only 80% of those who attended screening in the Northern region resided within 3km of the polyclinics, 94% of the lower socio-economic group who attended screening resided within 3km

of the polyclinics. The other regions also had a slightly higher proportion of women in the lower socio-economic group who attended screening residing within 3km of the polyclinics, when compared to the overall screening proportions.

4. Screening rate and age

The screening rate was higher in the younger cohort (50 – 59 years) compared to the older one (60 – 69 years) across all regions. Of those screened, the proportion of women aged 50 – 59 years was lowest in the Central region (60%) and highest in the North and West regions (72%).

Of the eligible population, 58%, 68% and 67% were 50 – 59 years in the Central, North and West regions respectively.

5. Screening rate and ethnicity

Of the eligible population, there were small ethnic differences between the five regions. The proportion of Chinese was highest in the Central and North-East regions (85 - 87%) and lowest in the North region (71%). The proportion of eligible Malays was highest in the North and East regions (12 – 13 %) and lowest in the Central and North-East regions (4%). The proportion of eligible Indians (and Others) was highest in the North region (17 %) and lowest in the North-East region (9%).

Screening rates, however, did not show corresponding differences. Across all regions, the proportion of those screened who were Chinese was between 19 – 23%. The proportion of those screened who were Malay was lowest in the Central region (16%) and highest in West region (23%). The proportion of those screened who were Indian (and Others) was lowest in the East (16%) and highest in the North East (33%).

II. Assessment

1. Assessment attendance rates and proximity to an assessment centre

Of the women screened (87,654), 8,854 (10.1%) required further assessment at a restructured hospital. The three assessment centres are located at restructured hospitals, all three of which are located in the Central region.

There were no big differences in assessment attendance rates with all five regions having a rate of 78 – 85%. Across the five regions, about 70% of those referred for assessment were in the 50 – 59 year age group and 30% were in the 60 – 69 year age group. Attendance rates in both age ranges mirrored the referral rates.

2. Assessment attendance rates and socio-economic status

Of the total number of women referred for assessment, the proportion of women from the lower socio-economic group (using housing type of 3-room HDB flat and smaller as a proxy), ranged from 9% to 26% across the 5 regions, with the Central region having the highest proportion (26%) of referred women in the lower socio-economic group and the East region having the lowest (9%).

Assessment attendance rate of women in the lower socio-economic group was lowest in the East region with only 16% of women in the lower socio-economic group who needed further assessment actually attending their assessment appointments. In contrast, 55% of those in the North region attended their appointments, with the assessment attendance rates for the other three regions at about 30%. In general the assessment attendance rate of women in the lower socio-economic group was lower than the overall assessment attendance rates (which was 79 – 81%) in all five regions.

DISCUSSION

The overall screening rate was low in all 5 regions and lowest in the Central and East regions, despite most of the subsidised screening centres being located in the Central region.

The proportion of eligible women in the lower socio-economic group was lowest in the East region (12%) and highest in the Central region (26%). The lower screening rates observed in the East regions may be attributed to the fact that that there are relatively more eligible women in the middle and upper socio-economic groups in this region – and these more affluent women may have gone for their screening mammogram to centres outside of the subsidised programme, for example to a private x-ray centre or to a restructured hospital. This information would not be captured by the BreastScreen Singapore database

Our findings also showed that the proportion of lower socio-economic group women screened was highest in the North region – more than 50% were screened despite forming only 20% of the eligible population. This proportion was lowest in the East region, suggesting that this group could be targeted by more focused marketing and promotion efforts.

Not surprisingly, given that polyclinics are located in high-density areas, the majority (more than 90%) of women who attended screening resided within 3km of the polyclinics, except for the North region where a lower proportion (80%) resided within 3km of the polyclinics. This is likely to be due to the smaller number of polyclinics in the North region. From the programme's perspective, it may be useful to provide more mobile mammography screening services, via the Mammobus, to areas in the North.

In the analysis of screening in the different age groups, the rate was lower in the older group (60 – 69 years) across all regions, especially in the

North and West regions. To reach this group of women, the programme could work with healthcare service providers as well as with community and grassroots organisations to promote screening for older women. This could be in the form of specific messaging tailored to this group as well as providing mobile mammography services especially at community events.

In terms of ethnicity as a determinant of screening, the proportion of Malay women screened was lowest in the Central region, while the proportion of Indians (and Others) screened was lowest in the East region. These regions could be targeted for ethnic-specific promotion events to increase coverage. Interestingly, the proportion of Indians (and Others) screened was highest in the North-East region, despite the proportion of eligible Indians (and Others) being the lowest in this region. This may warrant a more in-depth analysis to ascertain the reason for this; for example, are ethnic-specific promotion events more prevalent in the North-East region.

With regard to the findings related to assessment attendance, it is heartening to note that about 80% of those referred for assessment attend their assessment appointment at a restructured hospital. As we do not have data of those who may have gone to a private healthcare institution for assessment, the actual assessment attendance rate may well be higher.

A key finding was that fewer women in the 60 – 69 age group attended their assessment appointments; for every 2 women aged 50 – 59 years who attended their assessment, only 1 women aged 60 – 69 years did so. This could suggest that this group could need more education and motivation to ensure that they attend their assessment appointments.

STUDY LIMITATIONS

It is acknowledged that this study has some limitations. Firstly, as the data relates only to the subsidised breast cancer screening programme, BreastScreen Singapore, the findings are only generalisable to the programme population and not to the entire population. Secondly, in view of the large numbers, it is not meaningful to test for statistically significant differences between the regions using bivariate analysis. We intend to include all the independent variables (age, ethnicity, region, proximity) in a single logistic regression model, and thus be able to compare how much more likely women from one region are to be BreastScreen Singapore clients than women from another region.

CONCLUSION

Despite the limitations, the analysis using the GIS to geocode the various datasets has provided us with some interesting insights into the differences in screening behaviour in the five regions of Singapore.

The Health Promotion Board intends to continue monitoring screening and assessment rates using the GIS to determine if targeted and specifically

tailored promotion programmes can make a difference in reaching 'the right women' for breast and cervical cancer screening.

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Author(s) Photograph (attached)

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Dr Shyamala Thilagaratnam is Director of the Healthy Ageing Division at HPB. She is responsible for chronic disease management initiatives, especially those related to patient education and empowerment. Several new national initiatives have been implemented in the past year - the Integrated Screening Programme, the Nurse Educator Programme, and most recently, the Pre-diabetes Intervention Programme. The Division is also responsible for the promotion and quality assurance aspects of the national breast and cervical cancer screening programmes. Shyamala also has oversight of the development of the Singapore eHealth Portal which includes tailored modules for web-based self-management of diabetes, weight and smoking cessation.

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Ms Low Sau Chan is the Chief Information Officer of Health Promotion Board (HPB). The CIO Office was only set up in 2006 and she was instrumental in growing the Office in strength. Under her direction, several innovative IT initiatives were identified and implemented by actively exploiting IT optimally.

Prior to joining HPB, she had worked in various government agencies overseeing IT departments.

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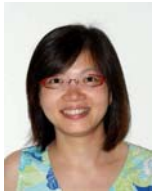

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Ms Christine Fock is the Acting Deputy Director (Integrated Screening Department, Healthy Ageing Division) with the Singapore Health Promotion Board (HPB).

Since joining HPB in 2000, she has been responsible in conceptualising and introducing National Cancer Screening Programmes for Singaporean women, namely BreastScreen Singapore and CervicalScreen Singapore programmes that promote the importance of early detection through regular screening to women as well as to ensure quality assurance of these programmes. A new national screening initiative, Integrated Screening Programme, has also been implemented last year to promote essential chronic disease screening to Singaporean residents aged 40 years and older. These national initiatives aim to reduce the prevalence and severity of key disease conditions.

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Ms Poey Lee is the IT Consultant (Application Services Department, Chief Information Officer's Office) of HPB.

Working in HPB since 2006, Poey's role includes project management and vendor management for many HPB projects where one of it is BreastScreen Singapore and CervicalScreen Singapore Systems. Working with many HPB users, Poey strategies with technical services team to identify and exploit suitable technologies and conceptualises, develop and drive infocomm projects to meet users' requirements. She also value-add to customers by providing advice on best practices in exploiting appropriate technology, reviewing and improving their work processes, facilitating and supporting customers' change management process and influencing their alignment with the eGovernment agenda.

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Lee Kim Haw is the Principle Executive (Land Data Hub) with Land Information Centre of Singapore Land Authority (SLA). His major role is to promote and proliferate the use of GIS and land information amongst the public agencies and businesses.

Since joining SLA in 2008, he has been providing assistance and consultancy services in areas of expertise to other teams within SLA and other agencies to enable successful completion of projects. He assists in conceptualising and creating proof-of-concept GIS applications. He also assists in managing strategic projects within SLA as well as collaborating with external agencies to meet the objectives of Singapore Geospatial Collaborative Environment (SG-SPACE).