Provider Distribution

Policy, Research and Monitoring

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EXECUTIVE SUMMARY

Problem Statement

Utilisation levels of the current healthcare system in the medical schemes industry are driven by curative interventions at tertiary health level. Medical schemes benefits mostly provide for catastrophic interventions. Healthcare costs have risen at alarming rates, while the private health delivery system has grown more concentrated.

Findings from the Health Market Inquiry (HMI), and the National Health Insurance (NHI) White Paper have questioned whether market size has had any beneficial effects on economies of scale. The norm of the current healthcare delivery system seems to exclude of economies of scale, and evidence on effective integrated managed health care interventions.

The NHI White Paper envisages that Ideal Clinics will be the first point of healthcare contact, and will provide effective cover for less to consumers who are typically exposed to tertiary health care interventions. In addition, the Bargaining Council market must find a space in the medical schemes industry.

The Council for Medical Schemes (CMS) is developing a comprehensive primary health package, which will be part of a standardised base package. Understanding the distribution of general practitioners (GPs), relative to medical scheme beneficiaries is essential if the standardised base package is to achieve effective cover within integrated designated service provider (DSP) network articulated by both the HMI and NHI White Paper. This analysis unpacks some of the impending research questions on the re-engineering the primary healthcare delivery system.

Findings & Recommendations

An analysis was conducted on the distribution of general practitioners (GPs), relative to, the geographic location of medical scheme beneficiaries' postal codes. Observations were made regarding the equal (fair) access to GPs, and the relative efficiency of producing healthcare interventions. Summary statistics and inference analyses are from a spatial perspective, using appropriate methods. Observations on equality are augmented by regressions that estimate the marginal effects that determine the utilisation of GPs (cost of healthcare utilisation). Quantile regression techniques are reported with ordinary least squares (OLS). The intention is to assess the impact of determinant variables for the entire geographic distribution of GPs, rather than, only reporting mean observations across spatial areas. The significant observations are presented in the sub-paragraphs below.
**Descriptive provincial overview: indicators of supply and demand underlying resource allocation**

**Key findings**

The analysis found that the province with the highest utilisation levels was Gauteng, and the lowest level of utilisation was Northern Cape. The key supply and demand indicators behind the utilisation levels were:

i) Gauteng had the highest number of GPs and medical schemes beneficiaries, and

ii) Northern Cape had the lowest number of GPs and medical schemes beneficiaries, therefore

iii) The utilisation of GP services at provincial level seems to be positively associated with beneficiary and GP numbers.

The analysis found that the province with the second lowest levels of utilisation was North West, and the third lowest level of utilisation was Limpopo. The key supply and demand indicators behind the utilisation levels were:

i) North West had the highest patient loads and the lowest density ratios, and

ii) Limpopo had the lowest patient loads and the highest density ratios, therefore

iii) It would seem that there are no direct positive associations between patient loads or density ratios with the utilisation of GP health care services.

Although these findings are meaningful, they are hardly useful for resolving allocation problems. For example, sparsely populated areas such as the Northern Cape might be potentially underserved areas. However, as has been observed, patient loads on their own do not seem to be positively associated with utilisation. Therefore, some other criteria will be required to resolve resource allocation problems.

**Recommendations**

Resource allocation problems should be resolved by:

i) Conducting equality and efficiency analysis techniques.

ii) The allocation of healthcare resources, such as GPs, should be evaluated across the entire distribution of beneficiaries in terms of healthcare demand, using utilisation expenditure or GP visits.

iii) Spatial analysis tools such as ARC GIS should be used to conduct equality and efficiency analysis across geographic health markets.
**Descriptive district overview: indicators of supply and demand underlying resource allocation**

**Key findings**

This section tried to identify interrelationships that could explain healthcare utilisation and resource allocation. The experience in South African districts can be summarised as follows:

i) There is a positive relationship between the number of GPs available and expenditure of GP healthcare services.

ii) There is no observable association between out-of-pocket (OOP) and the number of GPs available, utilisation nor patient loads or density ratios.

iii) The number of covered beneficiaries has a positive association with patient loads, and a negative association with density ratios.

iv) Some districts seem to be sparsely populated, with no signs of being underserved areas. These districts show relatively low proportional shares of available GPs in a province, while having the lowest proportional share of covered medical schemes’ beneficiaries. These districts show a high concentration of GPs, and thus yielding low patient loads.

These findings are meaningful for identifying potential gaps regarding supply and demand for GP health services, however, they do nothing to explain whether high patient loads (low coverage ratios) are signs of a district being an underserved area. Furthermore, the associations drawn from the descriptive analysis does not explain a justified cause for suspecting inequality in the allocation of GP services, nor whether efficiency or productivity should support a re-allocation of healthcare resources.

**Recommendations**

i) Resource allocation problems at district level should be resolved by forming spatial clusters with GPS coordinates with ARC GIS spatial analysis packages.

ii) Equality and efficiency analyses should be applied to spatial clusters, rather than, working at district and postal level.

iii) Such an analysis will assist with developing DSP networks in the private sector, while incorporating integrating planning processes between the public institutions and the Competition Commission.

**Using inequality analysis to establish underserved areas**

The equality of access analysis using Gini coefficients and quintile distributions of beneficiaries cumulative expenditure of GP health services, lends itself better to identifying places that are potentially underserved areas.
More specifically:

i) Lower quintiles had low concentration of GPs and thus high patient loads per GP practice

ii) Lower quintiles also enjoyed much less of the total health spend than higher quintiles.

iii) These types of observations lend themselves well for establishing policy criteria for the registration of DSPs and networks.

**Economies of scale and GP allocation**

There are increasing returns (IRS) for all quintiles except for quintile five. Meaning that if more resources were added to quintile 5, the less efficient the healthcare utilisation outcomes. This suggests that more resources should be redirected to quintiles with increasing returns to scale (economies of scale), because as we have seen, lower quintile has high patient loads and Gini coefficients. This type of reallocation would increase socially welfare, as it is both efficient and fair.

**Future Research**

i) Future research outputs on the distribution of health care providers should inform strategic and policy interventions on human resources for health (HRH). The research ought to inform designated service provider and health care network registrations in the public and private sector for a coordinated:

   a) unravelling of future public-private partnership arrangements, and
   b) enablement of medical schemes in their future roles of providing access to health care financing and coordinated cost-effective delivery care.

ii) Future research should incorporate community rates and benefit design to establish whether effective health care delivery can be improved in terms of the characteristics of health care demand.

iii) Future research should incorporate the findings from the equality and efficiency analysis to the:

   a) benefit design standardisation project’s portal for the market segmentation experiment; and
   b) patient experience survey findings on healthcare quality for chronic conditions

iv) Future research should undertake a time series analysis on Human Resources for Health informed by a panel data derived calibration of future human resources for health (HRH) needs. For example, the calibration could be informed by the:

   a) characteristics of health care demand and behaviour (incorporating the learnings from the market segmentation experiment and patient experience survey).
   b) existing market equity and efficiency outcomes.
Practical Implications of the Study

The practical implications arising from the findings of this study, and the identified future research areas should be used for:

i) Engaging the Office of the Strategist on the benefits of surrendering work on quality of health to an independent organisation, or providing beneficiaries with information on quality from a consumer watch/protection perspective (as mandated by section 7 of the Medical Schemes Act):

ii) Engaging with the Ministerial Committee on Human Resources for Health:

iii) Engaging with Competition Commission on Networks and DSPs.

iv) Engaging with Competition Commission on implications of this report relative HMI findings health quality outcomes and networks:

v) Engaging Office of Health Standards & Compliance (OHSC) on coordinated approach to registering health care networks/clinics, leading Ideal Clinics policy environment:
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1. INTRODUCTION

1.1 Policy Issues

The Competition Commission’s (CC) Health Market Inquiry (HMI) found a need for standardised base package (SBP), which is comprehensive, and includes primary healthcare benefits. On the other hand, the National Health Insurance (NHI) White Paper’s policy problem statement pronounced that healthcare benefits in the private health financing sector were too hospice-centric, and no economies of scale seem to be present in both public and private health sectors. Thus, the primary health care service system needs to be re-engineered.

A primary care package is being developed by the Council for Medical Schemes (CMS). The package is in the process of being costed, and a process of receiving stakeholder comments had been initiated. Most importantly, the impact that these regulatory changes will have on the “effective cover” of beneficiaries cannot be overlooked.

1.2 Purpose

Without an efficiency and equality analysis, an effective policy recommendation cannot be made. Descriptive statistics are useful for understanding what the data look like.

The purpose of this analysis is to evaluate the determinants of health expenditure at different levels of healthcare expenditure. The ultimate purpose of the analysis is an evaluation beyond the mean, in order to inform policy formulation processes. Considering the entire distribution of medical schemes beneficiaries, relative to the location of practitioners; allows for making recommendations on the redistributions of resources when incorporating equality and efficiency analysis to the evaluation methods.

An analysis on the geographic allocation of primary care utilisation costs, and the distribution of general practitioners (GPs); should provide an understanding on equality and efficiency outcomes in the private health sector. This analysis should highlight where issues related to the sufficiency of health care access, relative to the demand by medical schemes beneficiaries (identification of underserved geographic areas). In addition, on the supply-side; the geographic allocation of GPs relative to utilisation outcomes, should identify instances where there are increasing economies of scale (geographic areas where additional resources will improve health care outcomes).
The analysis will present the data at district level. Thus, the Research & Monitoring Unit (R&M) hopes to contribute to the Ministerial Committee on Human Resources for Health by providing recommendations that could potentially speak to:

i) Tapping into the resources of districts that have decreasing economies of scale. Specifically, better healthcare outcomes are attainable through public-private partnerships for providing coordinated contributions to the Ideal Clinic (ID) objectives.

ii) Identifying underserved districts with increasing economies of scale. Specifically, districts that need to be prioritised for registering managed care and designated service provider (DSP) networks.

1.3 Objectives

The objectives are:

i) To describe the health insurance market from the perspective of access to general practitioners (GPs) for medical schemes’ beneficiaries, in four of the largest geographic markets. Specifically: 1) Gauteng; 2) Western Cape; 3) KwaZulu-Natal; and 4) Eastern Cape.

ii) To describe market access within provincial districts.

iii) To explain access as a result of how the allocation equality (using Gini-coefficients) and efficiency (using data envelopment analysis (DEA)) outcomes. We will use Gauteng as an example.

iv) To conduct a quantile regression to describe the marginal effects of market access for the whole distribution of medical scheme beneficiaries within geographic healthcare markets. This allows for a more meaningful diagnosis of the allocation problem related to human resources for health (HRH). Policy recommendation on resource re-allocation should be relevant for different social groups, and not based on a statistical mean.

2. RESULTS

This section will provide analysis results that describe the allocation of GPs, and the outcome of such analysis from a spatial perspective. The spatial analysis will take on the following forms:

i) Practitioner density ratios, to report the ratio of GPs to medical scheme beneficiaries across geographic health care markets.

ii) Coverage ratios per practice, which can be interpreted as the extent of patient loading per practice. Specifically, the number of beneficiaries that are attended by one GP at point of service.
iii) Bubble charts will be used to find relationships between health care utilisation and determinants of health consumption for four the largest provinces. Specifically: 1) Gauteng; 2) Western Cape; KwaZulu-Natal; 4) Eastern Cape. The analysis will breach provincial boundaries by providing analyses at district level.

iv) Gini-coefficients, the Hoover index, and deciles to describe inequalities in accessing GP healthcare services.

v) Quantile regression will be used to draw inferences about the impact of health care demand and supply factors on total utilisation in Gauteng districts. The analysis will be evaluated to assess whether results corroborate with the quintile analyses conducted with inequality indices (i.e. Gini-coefficient).

vi) Data Envelopment Analysis (DEA) will be used to describe economies of scale (efficiencies) in Gauteng and within the provincial districts. The analysis will be used to evaluate whether re-allocations within and between districts are able to trade-off dis-economies for lower inequality outcomes.

The significance of this analysis is that it can identify problem in the system of provider allocation, such that residual resources are re-allocated to underserved areas. This may have cost-saving impact on the implementation of a comprehensive primary care system, particularly for coordinating an integrated and collaborative partnership between the private and public sectors towards implementing the Ideal Clinics delivery system.

2.1 Demand & Supply Characteristics of Resource Allocations

This subsection provides a high-level overview of some key indicators associated with the utilisation of GP health services. It makes use of heat maps which indicate the relative concentration variables determining health care utilisation. The spatial descriptive analysis covers four of the largest health care markets for GP services in the private health market South Africa. The reported provinces and districts are for:

i) Gauteng,
ii) Western Cape,
iii) KwaZulu-Natal, and
iv) Eastern Cape.

2.1.1 Provincial overview: demand & supply behind resource allocation

This subsection will provide an analysis of key indicators that may explain expenditure utilisation of GP services at a provincial level. We then provide key findings.

2.1.1.1 Provincial overview: analysis of the demand and supply behind resource allocation

Table 1 reports critical indicators are on the demand and supply side which determine the allocation of GPs across all South African provinces. The reported data are based on direct claims made by GPs to medical schemes.
The key observations (Table 1) made for 2018 are:

i) 13,805 unique practice number for GPs made direct claims to medical schemes for providing services to beneficiaries.

ii) The national density ratio (concentration -- number of GPs per 10,000 beneficiaries) was 15.7 GPs per 10,000 medical schemes' beneficiaries.

iii) Provinces with the highest concentration of GPs was: 1) Limpopo; 2) Free State; 3) KwaZulu-Natal; and 4) Eastern Cape.

iv) The national coverage ratio/patient loads (patient loads -- number of beneficiaries per GPs) was 638 medical schemes' beneficiaries per GPs.

v) Provinces with the highest patient loads were: 1) North West; 2) Northern Cape; 3) Gauteng; and 4) Mpumalanga.

vi) Provinces with medical schemes beneficiaries highest concentration were (largest demand): 1) Gauteng; 2) Western Cape; 3) KwaZulu-Natal; 4) Eastern Cape.

Table 1: Number of GPs, beneficiaries, density ratios & patient loads across provinces (2018)

<table>
<thead>
<tr>
<th>Province</th>
<th>GPs</th>
<th>Density Ratio</th>
<th>Patient Loads</th>
<th>Beneficiaries (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Cape</td>
<td>1 075</td>
<td>16.5</td>
<td>608</td>
<td>7%</td>
</tr>
<tr>
<td>Free State</td>
<td>732</td>
<td>18.6</td>
<td>538</td>
<td>4%</td>
</tr>
<tr>
<td>Gauteng</td>
<td>5 004</td>
<td>14.1</td>
<td>708</td>
<td>40%</td>
</tr>
<tr>
<td>KwaZulu-Natal</td>
<td>2 310</td>
<td>18.4</td>
<td>544</td>
<td>14%</td>
</tr>
<tr>
<td>Limpopo</td>
<td>973</td>
<td>20.6</td>
<td>487</td>
<td>5%</td>
</tr>
<tr>
<td>Mpumalanga</td>
<td>793</td>
<td>15.3</td>
<td>652</td>
<td>6%</td>
</tr>
<tr>
<td>North West</td>
<td>626</td>
<td>13.2</td>
<td>760</td>
<td>5%</td>
</tr>
<tr>
<td>Northern Cape</td>
<td>236</td>
<td>13.7</td>
<td>732</td>
<td>2%</td>
</tr>
<tr>
<td>Western Cape</td>
<td>2 056</td>
<td>15.5</td>
<td>644</td>
<td>15%</td>
</tr>
<tr>
<td>National Level</td>
<td>13 805</td>
<td>15.7</td>
<td>638</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note: This is based on the distribution of GPs who claimed from medical schemes in 2018.

Figure 1 is a heat map that reports the distribution of medical schemes' beneficiaries across the nine South African provinces. The highest concentration of medical schemes' beneficiaries was in Gauteng (40%). The lowest concentration of medical schemes' beneficiaries was in Northern Cape (2%).
Figure 1: Heat map -- distribution of beneficiaries across provinces (2018)

Figure 2 is a heat map that reports the distribution of GPs across the nine South African provinces. The highest number of GPs was in Gauteng (36%). The lowest number of medical schemes’ beneficiaries was in Northern Cape (1.7%).

Note: This is based on the distribution of GPs who claimed directly from medical schemes.
**Figure 3** is a heat map that reports the density ratios (number of GPs per 10,000 beneficiaries) of GPs across the nine South African provinces. The highest concentration of GPs was in Limpopo (21 GP to 10,000 beneficiaries). The lowest concentration of GPs was in North West (13 GPs to 10,000 beneficiaries).

![Figure 3: Heat map – No. of GPs per 10,000 beneficiaries (density ratio) across the provinces (2018)](image)

**Note:** This is based on the distribution of GPs who claimed directly from medical schemes.

**Figure 4** is a heat map that reports the patient loads (number of beneficiaries per GPs) of GPs across the nine South African provinces. The highest patient loads were in North West (760 beneficiaries to one GP). The lowest patient loads were in Limpopo (13 GPs to 10,000 beneficiaries).
Figure 4: Heat map – No. of beneficiaries per GP (patient loads) (2018)
Note: This is based on the distribution of GPs who claimed directly from medical schemes.

Figure 5 is a heat map that reports the distribution of utilisation for GP healthcare services, across the nine South African provinces. The highest utilisation levels were in Gauteng (39% of total utilisation of GP services). The lowest utilisation of GP services was in Northern Cape (2% of total utilisation of GP services).

Figure 5: Heat map – Utilisation of GP health services (2018)
Note: This is based on the distribution of GPs who claimed directly from medical schemes.
2.1.1.2 Provincial overview: key findings

The analysis found that the province with the highest utilisation levels was Gauteng, and the lowest level of utilisation was Northern Cape. The key supply and demand indicators behind the utilisation levels were:

iv) Gauteng had the highest number of GPs and medical schemes’ beneficiaries, and
v) Northern Cape had the lowest number of GPs and medical schemes’ beneficiaries, therefore
vi) The utilisation of GP services at provincial level seems to be positively associated with beneficiary and GP numbers.

The analysis found that the province with the second lowest levels of utilisation was North West, and the third lowest level of utilisation was Limpopo. The key supply and demand indicators behind the utilisation levels were:

iv) North West had the highest patient loads and the lowest density ratios, and
v) Limpopo had the lowest patient loads and the highest density ratios, therefore
vi) It would seem that there aren’t any direct positive associations between patient loads or density ratios with the utilisation of GP health care services.

2.1.2 Overview at district level: demand & supply behind resource allocation

This sub-section will provide an overview of which elements of demand and supply describe health resource allocation at district level. The districts of four provinces will be analysed. These provinces are:

i) Eastern Cape,
ii) Gauteng,
iii) KwaZulu-Natal, and
iv) Western Cape.

We will provide an analysis of factors underlying resource allocation in districts, stratified at provincial level. We then give a summary of key findings.

2.1.2.1 Overview at district level: analysis of supply and demand behind resource allocation

Each section will provide a histogram that reports the interrelationships between proportional shares covered beneficiaries, number of GPs, and utilisation of GP health services, at district level.

We will then use bubble graphs to show interrelationships within district level healthcare markets. The interrelationships between factors underlying resource allocation will be described as follows:
i) Outcomes caused by relationships between the levels of covered beneficiaries and density ratios, that have an impact on patient loading.

ii) Outcomes caused by relationships between the number of available GPs and utilisation of GP services, that have an impact on covered beneficiaries.

iii) Outcomes caused by relationships between the number of available GPs and utilisation of GP services, that have an impact on the level of out-of-pocket payments (OOP).

iv) Outcomes caused by relationships between the patient loads and density ratios that have an impact on the utilisation of GP healthcare services.

v) Outcomes caused by relationships between the patient loads and density ratios that have an impact on the level of OOP.

2.1.2.1.1 Eastern Cape districts

Figure 6 is a bar chart that reports the proportional shares of covered beneficiaries, number of available GPs, and utilisation of GP healthcare services across 8 districts in Eastern Cape, in 2018. The figure (Figure 6) reports the following characteristics regarding the proportional shares:

i) The highest proportional shares of covered beneficiaries, number of available GPs and utilisation of GP healthcare services were: 1) Nelson Mandela Bay; 2) Buffalo City; and 3) OR Tambo.

ii) The lowest proportional shares of covered beneficiaries, number of available GPs and utilisation of GP healthcare services were: 1) Alfred Nzo; 2) Joe Gqabi; and 3) Chris Hani.

iii) Districts with imbalances between the number of available GPs and utilisation were: 1) Nelson Mandela Bay (less GPs than utilisation and covered beneficiaries); 2) Buffalo City (more utilisation than GPs and beneficiaries); 3) OR Tambo (more GPs than utilisation and beneficiaries); 4) Chris Hani (more GPs than utilisation and beneficiaries)
**Figure 6: Eastern Cape districts -- proportional shares beneficiaries, utilisation & no. of GPs (2018)**

**Figure 7** is a bubble graph that reports how the interrelationships between the number of covered beneficiaries and density ratios, resulted in coverage ratios (patient loads per GP practice), for Eastern Cape in 2018. The most noteworthy interrelationships are:

i) The district with the largest number of beneficiaries is Nelson Mandela Bay District, which has patient loads (coverage ratio) of 667 beneficiaries per GP practice. The patient loads in the Nelson Mandela Bay area the third highest in Eastern Cape. The plot shows (Figure 7) that the Nelson Mandela Bay area has the third lowest density ratio. The conclusion that can be drawn from Figure 7 is that the Nelson Mandela Bay area has a large number of beneficiaries, and that this has negatively impacted the concentration of GPs (density ratio), and patient loads per GP practice (coverage ratio). This corroborated by the histogram in Figure 6. Specifically, the proportional share in GPs is lower than the proportional share in beneficiaries and utilisation.

ii) The district with the highest density ratio is the Chris Hani district (Figure 7). Chris Hani district also has the lowest patient loads per GP practice (coverage ratio) which is 422 beneficiaries per GP practice. The result from Figure 7 suggests that Chris Hani district may be sparsely populated resulting in low coverage ratios. This is corroborated by Figure 6 which shows a higher proportional share of available GPs than of covered beneficiaries.
Figure 7: EC districts – relationships between beneficiaries, density & coverage ratios (2018)

Note: Coverage ratios equate patient loads per practice.

Figure 8 is a bubble graph that reports how the incidence, between the number of available GPs and utilisation of GP healthcare services, relates to the number of covered beneficiaries in Eastern Cape districts in 2018. The following observations are made from Figure 8:

i) Nelson Mandela Bay district has the largest number of available GPs. The district also has the most amount of utilisation of GP health services. Underlying the interaction between GPs and utilisation is the greatest share of beneficiaries in Eastern Cape. There is therefore a positive association between the number of available GPs and utilisation. Incidental to this is the largest share of covered beneficiaries in the Nelson Mandela Bay district (Figure 8). The observations made in figure 8 are corroborated by the bar chart in Figure 6, Nelson Mandela Bay district has the largest proportional shares of beneficiaries, GPs and utilisation.

ii) Alfred Nzo district has the lowest number of covered beneficiaries and utilisation of GP services (Figure 8). This is coincidental to the fact that the district has the lowest share of covered beneficiaries in Eastern Cape. This corroborates with the observations made from the histogram in Figure 6.
**Figure 8:** EC districts – no. of GPs, beneficiaries & utilisation (2018)

**Figure 9** is a bubble graph which exchanges between three relationships -- the number of available GPs, utilisation and OOP, in Eastern Cape districts for 2018. The exchanges occur as follows:

i) There is generally a positive relationship between the number of available GPs and utilisation of GP healthcare services in among all Eastern Cape districts (Figure 9).

ii) There is no association between OOP, the number of GPs and healthcare utilisation (Figure 9).
Figure 10 tries to find a pattern of association between patient loads (coverage ratio), density ratios and utilisation levels in Eastern Cape districts, for 2018. There are no patterns of association for linked to utilisation. Much like the lack of association found between patient loads (coverage ratios), density ratios and OOP in Figure 9.

![Graph showing utilization, coverage, and density ratios in Eastern Cape districts in 2018.](image)

Figure 10: EC districts – utilisation, coverage & density ratios (2018)

*Note:* Coverage ratios equate patient loads per practice.

Figure 11 is a bubble graph that tries to identify patterns in connections between patient loads (coverage ratios), density ratios (concentration of GPs), and OOP in Eastern Cape districts in 2018. There are no observable associations.

![Graph showing OOP, coverage, and density ratios in Eastern Cape districts in 2018.](image)

Figure 11: EC districts – OOP, coverage & density ratios (2018)

*Note:* Coverage ratios equate patient loads per practice.
2.1.2.1.2 Gauteng districts

Figure 12 is a bar chart that reports the proportional shares of covered beneficiaries, number of available GPs, and utilisation of GP healthcare services across 5 districts in Gauteng, in 2018. The figure (Figure 12) reports the following characteristics regarding the proportional shares:

i) The highest proportional shares of covered beneficiaries, number of available GPs and utilisation of GP healthcare services were: 1) City of Johannesburg Metro. district; and 2) City of Tshwane Metro. District.

ii) The lowest proportional shares of covered beneficiaries, number of available GPs and utilisation of GP healthcare services were: 1) West Rand district; and 2) Sedibeng district.

iii) Districts with imbalances between the number of available GPs and utilisation were: 1) City of Johannesburg Metro. district (more covered beneficiaries than GPs and utilisation); 2) City of Tshwane Metro. District (more GPs than utilisation, and much more GPs than covered beneficiaries).

Figure 12: Gauteng districts -- proportional shares beneficiaries, utilisation & no. of GPs (2018)

Figure 13 is a bubble graph that reports how the interrelationships between the number of covered beneficiaries and density ratios, resulted in coverage ratios (patient loads per GP practice), for Gauteng in 2018. The most noteworthy interrelationships were:

i) The district with the largest number of beneficiaries is Johannesburg Metro. District, which has patient loads (coverage ratio) of 879 beneficiaries per GP practice. The patient loads in the Johannesburg Metro. District are third highest in Gauteng (behind West Rand and Ekurhuleni). The plot shows (Figure 13) that the Johannesburg Metro. has the third lowest density ratio (behind West Rand and Ekurhuleni). The conclusion that can be drawn from Figure 13 for the Johannesburg Metro. District area is that because it has a large proportion of covered beneficiaries in Gauteng, it has one of the lowest levels GP concentration (density
ratio), and thus one of the highest patient loads (coverage ratios). This is corroborated by the histogram in Figure 12. Specifically, the proportional share in GPs in the Johannesburg Metro. District is much lower than the proportional share in beneficiaries.

ii) The district with the highest density ratio is the Tshwane Metro. district (Figure 13). The Tshwane Metro. district also has the lowest patient loads per GP practice (coverage ratio) which is 434 beneficiaries per GP practice. The result from Figure 13 suggests that the Tshwane Metro. district may have more GPs available than its proportional share in beneficiaries. This is corroborated by Figure 12 which shows a higher proportional share of available GPs than covered beneficiaries.

Figure 13: Gauteng districts – no. of beneficiaries, density & coverage ratios (2018)

Note: Coverage ratios equate patient loads per practice.

Figure 14 is a bubble graph that reports how the incidence, between the number of available GPs and utilisation of GP healthcare services, relates to the number of covered beneficiaries in Gauteng districts in 2018. The following observations are made from Figure 14:

i) The Johannesburg Metro. district has the largest number of available GPs. The district also has the most amount of utilisation of GP health services. Underlying the interaction between GPs and utilisation is the greatest share of beneficiaries in Gauteng. There is therefore a positive association between the number of available GPs, and utilisation. Coincidental to this is the largest share of covered beneficiaries in the Johannesburg Metro. district (Figure 14). The observations made in Figure 14 are corroborated by the bar chart in Figure 12, Johannesburg Metro. district has the largest proportional shares of beneficiaries, GPs and utilisation.
ii) West Rand district has the lowest number of covered beneficiaries and utilisation of GP services (Figure 14). This is coincidental to the fact that the district has the lowest share of covered beneficiaries in Gauteng. This corroborates with the observations made from the histogram in Figure 12.

Figure 14: Gauteng districts – no. of GPs, beneficiaries & utilisation (2018)

Figure 15 is a bubble graph which exchanges between three relationships -- the number of available GPs, utilisation and OOP, in Gauteng districts for 2018. The exchanges occur as follows:

i) There is generally a positive relationship between the number of available GPs and utilisation of GP healthcare services in among all Gauteng districts (Figure 15).

ii) There is no association between OOP, the number of GPs and healthcare utilisation (Figure 15).

Figure 15: Gauteng districts – no. of GPs, utilisation & OOP (2018)
Figure 16 is a bubble graph that tries to identify patterns in connections between patient loads (coverage ratios), density ratios (concentration of GPs), and OOP in Gauteng districts in 2018. There are no observable associations.

![Bubble Graph](image)

**Figure 16: Gauteng districts – OOP, coverage & density ratios (2018)**

2.1.2.1.3 Kwazulu-Natal districts

Figure 17 is a bar chart that reports the proportional shares of covered beneficiaries, number of available GPs, and utilisation of GP healthcare services across 11 districts in KwaZulu-Natal, in 2018. The figure (Figure 17) reports the following characteristics regarding the proportional shares:

i) The highest proportional shares of covered beneficiaries, number of available GPs and utilisation of GP healthcare services were: 1) eThekwini district; and 2) uMgungundlovu district.

ii) The lowest proportional shares of covered beneficiaries, number of available GPs and utilisation of GP healthcare services were: 1) Harry Gwala district; and 2) uMzinyathi district.

iii) eThekwini district has less GPs than covered beneficiaries.
Figure 18 is a bubble graph that reports how the interactions between the number of covered beneficiaries and density ratios, resulted in coverage ratios (patient loads per GP practice), for Gauteng in 2018.

The most noteworthy interrelationships were:

i) The district with the largest number of beneficiaries is eThekwini district, which has patient loads (coverage ratio) of 583 beneficiaries per GP practice. The patient loads in the eThekwini district are third highest in KwaZulu-Natal (behind King Cetshwayo District and uMkhanyakude District). The plot shows (Figure 18) that the eThekwini district has the third lowest density ratio (behind King Cetshwayo District and uMkhanyakude District). The conclusion that can be drawn from Figure 18 for the eThekwini district is that because it has a large proportion of covered beneficiaries in Gauteng, it has one of the lowest levels GP concentration (density ratio), and thus one of the highest patient loads (coverage ratios). This is corroborated by the histogram in Figure 17. Specifically, the proportional share in GPs in the eThekwini district is much lower than the proportional share in beneficiaries.

ii) The district with the highest density ratio is the Amajuba district (Figure 18). The Amajuba district also has the lowest patient loads per GP practice (coverage ratio), which is 320 beneficiaries per GP practice. The result from Figure 18 suggests that the Amajuba district may have more GPs available than its proportional share in beneficiaries. This is corroborated by Figure 17 which shows a higher proportional share of available GPs than covered beneficiaries.
Figure 18: KZN districts – no. of beneficiaries, density & coverage ratios (2018)

Note: Coverage ratios equate patient loads per practice.

Figure 19 is a bubble graph that reports how the incidence, between the number of available GPs and utilisation of GP healthcare services, relates to the number of covered beneficiaries in KwaZulu-Natal districts in 2018. The following observations are made from Figure 19:

i) The eThekwini district has the largest number of available GPs. The district also has the most amount of utilisation of GP health services. Underlying the interaction between GPs and utilisation is the greatest share of beneficiaries in KwaZulu-Natal. There is therefore a positive association between the number of available GPs, and utilisation. Coincidental to this is the largest share of covered beneficiaries in the eThekwini district (Figure 19). The observations made in Figure 19 are corroborated by the bar chart in Figure 12, eThekwini district has the largest proportional shares of beneficiaries, GPs and utilisation.

ii) Harry Gwala district has the lowest number of covered beneficiaries and utilisation of GP services (Figure 19). This is coincidental with the fact that the district has the lowest share of covered beneficiaries in KwaZulu-Natal. This corroborates with the observations made from the histogram in Figure 12.
Figure 19: KZN districts – no. of GPs, beneficiaries & utilisation (2018)

Figure 20 is a bubble graph which exchanges between three relationships -- the number of available GPs, utilisation and OOP, in KwaZulu-Natal districts for 2018. The exchanges occur as follows:

i) There is generally a positive relationship between the number of available GPs and utilisation of GP healthcare services in among all KwaZulu-Natal districts (Figure 20).

ii) There is no association between OOP, the number of GPs and healthcare utilisation (Figure 20).
**Figure 21** is a bubble graph that tries to identify patterns in connections between patient loads (coverage ratios), density ratios (concentration of GPs), and OOP in KwaZulu-Natal districts in 2018. There are no observable associations.

**Figure 21: KZN districts – OOP, coverage & density ratios (2018)**

### 2.1.2.1.4 Western Cape districts

**Figure 22** is a bar chart that reports the proportional shares of covered beneficiaries, number of available GPs, and utilisation of GP healthcare services across 6 districts in Western Cape, in 2018. The figure (Figure 22) reports the following characteristics regarding the proportional shares:

i) The highest proportional shares of covered beneficiaries, number of available GPs and utilisation of GP healthcare services were: 1) City of Cape Town district; and 2) Cape Winelands district.

ii) The lowest proportional shares of covered beneficiaries, number of available GPs and utilisation of GP healthcare services were: 1) Central Karoo district; and 2) Overberg district.
Figure 22: Western Cape districts -- proportional shares beneficiaries, utilisation & no. of GPs (2018)

Figure 23 is a bubble graph that reports how the interrelationships between the number of covered beneficiaries and density ratios, resulted in coverage ratios (patient loads per GP practice), for Western Cape in 2018. The most noteworthy interrelationships were:

i) The district with the largest number of beneficiaries is City of Cape Town District, which has patient loads (coverage ratio) of 656 beneficiaries per GP practice. The patient loads in the City of Cape Town District are the second highest in Western Cape (behind the Cape Winelands district). The plot shows (Figure 23) that the City of Cape Town District has the second lowest density ratio (the Cape Winelands district). The conclusion that can be drawn from Figure 23 for the City of Cape Town District area is that, because it has a large proportion of covered beneficiaries in Western Cape, it has one of the lowest levels GP concentration (density ratio), and thus one of the highest patient loads (coverage ratios).

ii) The district with the highest density ratio is the Overberg district (Figure 23). The Overberg district also has the lowest patient loads per GP practice (coverage ratio), which is 536 beneficiaries per GP practice. The result from Figure 23 suggests that the Overberg district may be sparsely populated, with more GP access than required. This is corroborated by Figure 22 which shows that Overberg has the second lowest share of covered medical schemes’ beneficiaries.
Figure 23: Western Cape districts – no. of beneficiaries, density & coverage ratios (2018)

Note: Coverage ratios equate patient loads per practice.

Figure 24 is a bubble graph that reports how the incidence, between the number of available GPs and utilisation of GP healthcare services, relates to the number of covered beneficiaries in Western Cape districts in 2018. The following observations are made from Figure 24:

i) The City of Cape Town district has the largest number of available GPs. The district also has the most amount of utilisation of GP health services. Underlying the interaction between GPs and utilisation is the greatest share of beneficiaries in Western Cape. There is therefore a positive association between the number of available GPs, and utilisation. Coincidental to this is that the largest share of covered beneficiaries is in the City of Cape Town district (Figure 24). The observations made in Figure 24 are corroborated by the bar chart in Figure 22, the City of Cape Town district has the largest proportional shares of beneficiaries, GPs and utilisation.

ii) The Central Karoo district has the lowest number of covered beneficiaries and utilisation of GP services (Figure 24). This is coincidental to the fact that the district has the lowest share of covered beneficiaries in the Western Cape. This corroborates with the observations made from the bar chart in Figure 22.
Figure 24: Western Cape districts – no. of GPs, beneficiaries & utilisation (2018)

Figure 25 is a bubble graph which exchanges between three relationships -- the number of available GPs, utilisation and OOP, in the Western Cape districts for 2018. The exchanges occur as follows:

i) There is generally a positive relationship between the number of available GPs and utilisation of GP healthcare services in among all Western Cape districts (Figure 25).

ii) There is no association between OOP, the number of GPs and healthcare utilisation (Figure 25).

Figure 25: Western Cape districts – no. of GPs, utilisation & OOP (2018)

Figure 26 is a bubble graph that tries to identify patterns in connections between patient loads (coverage ratios), density ratios (concentration of GPs), and OOP in Western Cape districts in 2018. There are no observable associations.

Figure 26: Western Cape districts – no. of GPs, utilisation & OOP (2018)
2.1.2.2 District overview: key findings

This section tried to identify interrelationships that could explain healthcare utilization and resource allocation. The experience in South African districts can be summarised as follows:

i) There is a positive relationship between the number of GPs available and expenditure of GP healthcare services.

ii) There is no observable association between OOP and the number of GPs available, utilisation nor patient loads or density ratios.

iii) The number of covered beneficiaries has a positive association with patient loads, and a negative association with density ratios.

iv) Some districts seem to be sparsely populated, with no signs of being underserved areas. These districts show relatively low proportional shares of available GPs in a province, while having the lowest proportional share of covered medical schemes' beneficiaries. These districts show a high concentration of GPs, and thus yielding low patient loads.

These findings are meaningful for identifying potential gaps regarding supply and demand for GP health services. That said, they do nothing to explain whether high patient loads (low coverage ratios) are signs of a district being an underserved area. Also, the associations drawn from the descriptive analysis does not explain a justified cause for suspecting inequality in the allocation of GP services, nor whether efficiency or productivity should support a re-allocation of healthcare resources.
2.2 Equal Access in Gauteng: A Detailed Analysis

The purpose of this section is to assess whether inequality indicators are better suited than coverage and density ratios, for identifying underserved or deprived areas, that need health resource re-allocation. Such an analysis will assist to make the registration of designated service providers (DSPs) and managed care integrated care networks more socially optimal.

This section will apply summary statistics that describe equality in access GP health services. We will first examine equality across Gauteng using postal codes, which are allocated to quintiles based on the cumulative distribution of per capita beneficiary expenditure on GP health services. We will provide key findings after conducting the Gauteng provincial analysis.

After an analysis on Gauteng at the provincial level, we will conduct a similar analysis on healthcare equality at district level. We will provide key findings of this analysis.

Quintiles are used to express cumulative expenditures on GP services, relative to the cumulative distribution of covered beneficiaries. The beneficiaries were allocated to strata by:

i) First sorting per capita expenditure on GP services per postal code, from lowest to highest per capita expenditure.
ii) The postal codes have been stratified into five equally populated strata of beneficiaries (each having 20% of the total covered beneficiaries).
iii) Each strata are ranked by per capita health expenditure.
iv) Strata 1 is quintile 1, which is the lowest stratification in terms expenditure on GP utilisation.
v) Strata 5 is quintile 5, which is the highest stratification in terms of expenditure on GP utilisation.

2.2.1 Gauteng: equality of access across provincial postal codes

2.2.1.1 Gauteng: an analysis on equality at the provincial level

Figure 27 is a web diagram that reports density ratios of GPs (number of GPs per 10,000 beneficiaries), across all of Gauteng’s postal codes. In general, Figure 27 shows that the concentration of GPs increases from the first to the fifth quintile. The following observations are made:

i) Quintile 1 had a density ratio of 3 GPs per 10,000 beneficiaries.
ii) Quintile 2 had a density ratio of 3 GPs per 10,000 beneficiaries.
iii) Quintile 3 had a density ratio of 6 GPs per 10,000 beneficiaries.
iv) Quintile 4 had a density ratio of 12 GPs per 10,000 beneficiaries.

v) Quintile 5 had a density ratio of 48 GPs per 10,000 beneficiaries.

Figure 27: Gauteng -- Density ratio by quintile (2018)

Figure 28 is a web diagram that reports patient loads per GP practice (number of beneficiaries per GPs practice), across all of Gauteng’s postal codes. In general, Figure 28 shows that patient loads per GP practice decrease from the first to the fifth quintile. The following observations are made:

i) Quintile 1 had patient loads of 3,804 beneficiaries per GPs practice.

ii) Quintile 2 had patient loads of 3,410 beneficiaries per GPs practice.

iii) Quintile 3 had patient loads of 1,667 beneficiaries per GPs practice.

iv) Quintile 4 had patient loads of 801 beneficiaries per GPs practice.

v) Quintile 4 had patient loads of 206 beneficiaries per GPs practice.

Figure 28: Gauteng – Patient loads by quintile
**Figure 29** is a bar chart that reports the distribution of GPs that were available per quintile in Gauteng in 2018. Here the number of GPs grows as one moves up the quintile. This corroborates with the observations made in **Figure 27** and **Figure 28**. The observations are as follows:

i) Quintile 1 had 3% of the GPs in Gauteng.
ii) Quintile 2 had 5% of the GPs in Gauteng.
iii) Quintile 3 had 8% of the GPs in Gauteng.
iv) Quintile 4 had 17% of the GPs in Gauteng.
v) Quintile 5 had 67% of the GPs in Gauteng.

![Figure 29: Gauteng – GPs by quintile](image)

**Figure 30** is a Lorenz curve which reports the cumulative distribution of beneficiaries (ranked from lowest to highest per capital spend on GP health services) on the x-axis, relative to, the cumulative distribution of healthcare expenditure on GPs by beneficiaries on the y-axis. The area between the blue curve (the actual distribution of expenditure across beneficiaries), and the orange linear line (line of equality), is the area of inequality concentration. This area of inequality concentration is quantified by the Gini-Coefficient.

**Figure 30** shows that health expenditure is unequally distributed. The results reported by **Figure 30** are as follows:

i) The first twenty percent (interval 0 to 0.2 on the x-axis) of the beneficiaries enjoy only 1 percent of the healthcare expenditure on GP health services in Gauteng. This group of beneficiaries is associated with quintile 1, which holds 20% of the medical schemes beneficiaries.

ii) The second twenty percent (interval 0.2 o 0.4 on the x-axis) of the beneficiaries enjoy only 2 percent of the healthcare expenditure on GP services in Gauteng. This group of beneficiaries is associated with quintile 2, which holds 20% of the medical schemes beneficiaries.
iii) The third twenty percent (interval 0.4 to 0.6 on the x-axis) of the beneficiaries enjoy only 3 percent of the healthcare expenditure on GP services in Gauteng. This group of beneficiaries is associated with quintile 3, which holds 20% of the medical schemes beneficiaries.

iv) The fourth twenty percent (interval 0.6 to 0.8 on the x-axis) of the beneficiaries enjoy only 12 percent of the healthcare expenditure on GP services in Gauteng. This group of beneficiaries is associated with quintile 4, which holds 20% of the medical schemes beneficiaries.

v) The fifth twenty percent (interval 0.8 to 1.0 on the x-axis) of the beneficiaries enjoy only 82 percent of the healthcare expenditure on GP services in Gauteng. This group of beneficiaries is associated with quintile 4, which holds 20% of the medical schemes beneficiaries.

vi) The Gini coefficient 0.689 which is highly unequal.

![Gauteng – Lorenz curve](image)

**Figure 30: Gauteng – Lorenz curve**

### 2.2.1.2 Gauteng: key findings on equality at provincial level

The equality of access analysis using Gini coefficients and quintile distributions of beneficiaries cumulative expenditure of GP health services, lends itself better to identifying places that are potentially underserved areas. More specifically:

i) Lower quintiles had low concentration of GPs and thus high patient loads per GP practice.

ii) Lower quintiles also enjoyed much less of the total health spend than higher quintiles.

iii) These types of observations lend themselves well for establishing policy criteria for the registration of DSPs and networks.

### 2.2.2 Gauteng: equality of access at district level

This section provides a similar analysis of inequality as the previous section. The difference is that the analysis is at district level. We use the Gauteng Metro. District to illustrate the relevance of the method.
2.2.2.1 **Analysis on Equality of access in Johannesburg Metro**

**Figure 31** is a web diagram that reports density ratios of GPs (number of GPs per 10,000 beneficiaries), across all of Johannesburg (JHB) Metro districts’ postal codes. In general, **Figure 31** shows that the concentration of GPs increases from the first to the fifth quintile. The following observations are made:

i) Quintile 1 had a density ratio of 2 GPs per 10,000 beneficiaries.
ii) Quintile 2 had a density ratio of 4 GPs per 10,000 beneficiaries.
iii) Quintile 3 had a density ratio of 2 GPs per 10,000 beneficiaries.
iv) Quintile 4 had a density ratio of 11 GPs per 10,000 beneficiaries.
v) Quintile 5 had a density ratio of 38 GPs per 10,000 beneficiaries.

![Figure 31: JHB Metro -- Density ratio by quintile (2018)](image)

**Figure 32** is a web diagram that reports patient loads per GP practice (number of beneficiaries per GPs practice), across all of JHB districts’ postal codes. In general, **Figure 32** shows that patient loads per GP practice decrease from the first to the fifth quintile. The following observations are made:

i) Quintile 1 had patient loads of 4,399 beneficiaries per GPs practice.
ii) Quintile 2 had patient loads of 2,843 beneficiaries per GPs practice.
iii) Quintile 3 had patient loads of 4,183 beneficiaries per GPs practice.
iv) Quintile 4 had patient loads of 931 beneficiaries per GPs practice.
v) Quintile 4 had patient loads of 263 beneficiaries per GPs practice.
Figure 32: JHB Metro – Patient loads by quintile (2018)

Figure 33 is a bar chart that reports the distribution of GPs that were available per quintile in the JHB Metro district in 2018. Here the number of GPs grows as one moves up the quintile. This corroborates with the observations made in Figure 31 and Figure 32. The observations are as follows:

i) Quintile 1 had 4% of the GPs in Gauteng.
ii) Quintile 2 had 5% of the GPs in Gauteng.
iii) Quintile 3 had 5% of the GPs in Gauteng.
iv) Quintile 4 had 20% of the GPs in Gauteng.
v) Quintile 5 had 86% of the GPs in Gauteng.

Figure 33: JHB Metro – GPs by quintile (2018)

Figure 34 shows that health expenditure is unequally distributed. The results reported by Figure 34 are as follows:
i) The first twenty percent (interval 0 to 0.2 on the x-axis) of the beneficiaries enjoy only 1 percent of the healthcare expenditure on GP health services in the JHB Metro. district. This group of beneficiaries is associated with quintile 1, which holds 20% of the medical schemes beneficiaries.

ii) The second twenty percent (interval 0.2 to 0.4 on the x-axis) of the beneficiaries enjoy only 1 percent of the healthcare expenditure on GP services in JHB Metro. district. This group of beneficiaries is associated with quintile 2, which holds 20% of the medical schemes beneficiaries.

iii) The third twenty percent (interval 0.4 to 0.6 on the x-axis) of the beneficiaries enjoy only 3 percent of the healthcare expenditure on GP services in JHB Metro. district. This group of beneficiaries is associated with quintile 3, which holds 20% of the medical schemes beneficiaries.

iv) The fourth twenty percent (interval 0.6 to 0.8 on the x-axis) of the beneficiaries enjoy only 12 percent of the healthcare expenditure on GP services in JHB Metro. district. This group of beneficiaries is associated with quintile 4, which holds 20% of the medical schemes beneficiaries.

v) The fifth twenty percent (interval 0.8 to 1.0 on the x-axis) of the beneficiaries enjoy only 83 percent of the healthcare expenditure on GP services in JHB Metro. district. This group of beneficiaries is associated with quintile 4, which holds 20% of the medical schemes beneficiaries.

vi) The Gini coefficient 0.696 which is highly unequal.

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2.2.2.2 Key findings on inequality in JHB Metro

The findings for this section are similar to the ones provided for Gauteng at a provincial level.
2.3 OLS & Quantile Regression: Determinants of Utilisation across Gauteng Districts

This section will provide regression analyses to assess whether the patterns and intuitive relationships observed in the descriptive statistics on resource allocation in the previous sections of the document, hold on an inferential basis. We provide ordinary least squares (OLS) regression, present the results alongside the estimated parameters emanating from a quantile regression. The intention is to determine whether the marginal effects of healthcare utilisation are different throughout the whole distribution of beneficiaries’ expenditure. Using the OLS regression suggests that everyone spends at the mean, therefore any intervention to re-allocate resources will be to generic to have optimal outcomes for different beneficiaries.

2.3.1 Summary statistics

Table 2 presents the summary statistics of identified deterministic variables of healthcare utilisation (in this utilisation of GP health services). The variables are drawn from districts in Gauteng:

i) City of Johannesburg Metropolitan Municipality district,
ii) City of Tshwane Metropolitan Municipality district,
iii) Ekurhuleni Metropolitan district.

Two districts were dropped due to severe imbalances in sample size. The data were also trimmed to eradicate extreme outliers. The box-and-whisker diagrams are attached in appendix 4.1. Ultimately, 293 postal codes (observations) were used to estimate sample parameters. OOP was dropped as the descriptive exploratory analysis in earlier section suggested that it didn’t have any association with the utilisation of GP services, from a spatial perspective. This makes sense as the data does not specify the nature of the underlying benefit options. Benefit entitlements were not controlled in the analysis.
2.3.2 Regression results

Table 3 summarises the results of the OLS and quantile regression. Tshwane and JHB are dummy variables, and their parameters are referenced with Ekurhuleni.

i) Marginal effects of districts on healthcare utilisation

- The districts are not statistically significant,
- Tshwane has less expenditure than Ekurhuleni,
- JHB district has higher expenditure relative to Ekurhuleni, and
- Quantile regression parameter estimates are not significantly different from the OLS mean.

ii) The marginal effects of number of GPs on utilisation of GP health services:

- Number of GPs positively associated with utilisation, and the association is statistically significant at p<0.05 (this confirms the descriptive analysis),
- That said the parameters of the OLS regression and quantile regression are not statistically significant, meaning there is no difference between the OLS mean and the Quantile parameters.
iii) The marginal effects of number of covered beneficiaries on utilisation:

- There is a negative association between number of covered beneficiaries and utilisation, which statistically significant
- The statistical significance applies to both OLS and quantile regressions
- That said, there is no statistical difference between the OLS and quantile regression’s percentile estimates.

Table 3: Summary statistics of sample for regression

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<th>20% Confidence interval</th>
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3.3.3 Quantile regression plots on determinants of health care utilisation

Figure 35 provides quantile regression plots of the deterministic variables across all percentiles (the whole distribution). All plots except beneficiaries and number of GPs are statistically different from zero (y-axis).
Figure 35: Plot of determinants of health claims at quantile percentiles
2.4 Efficiency: Allocation of General Practitioners in Gauteng

Figure 36 reports number GPs in Gauteng (x-axis), relative to scale efficiency (y-axis). The curve that increases at a decreasing rate, reflect the extent to which returns to scale (efficiency) decreases as more GPs are added. There are increasing returns (IRS) for all quintiles except for quintile five. Meaning that if more resources were added to quintile 5, the less efficient the healthcare utilisation outcomes. Suggesting that more resources could be redirected to quintiles with increasing returns to scale (economies of scale). Particularly as we have seen, lower quintile has high patient loads and Gini coefficients. This type of reallocation would increase socially welfare, as it is both efficient and fair.

Figure 36: Gauteng -- scale efficiencies vs total GP visits (2018)

Note: The number of GP visits are based on direct claims paid by medical schemes.
3. APPENDICES

Appendix 3.1: Removing Extreme Outliers

![Box plot showing claims distribution by DistrictCode]

![Box plot showing claims distribution by DistrictCode]
Appendix 3.2: Fitting Functional Forms to Data
Appendix 3.3: Full OLS Regression Parameter Estimates

| Variable               | Parameter estimate | Standard error | t-Value | Pr > |t| |
|------------------------|--------------------|----------------|---------|------|---|
| Intercept              | 1457 043***        | 296 260        | 4.89    | <.0001 |   |
| Tshwane vs Ekurhuleni  | -375 522           | 393 926        | -0.95   | 0.3412 |   |
| Johannesburg vs Ekurhuleni | 368 049        | 352 484        | 1.04    | 0.2973 |   |
| NoOfGPs                | 423 159***         | 28 448         | 14.37   | <.0001 |   |
| Beneficiaries          | -47**              | 14             | -3.46   | 0.0005 |   |
Appendix 3.4: Full Quantile Regression Parameter Estimates

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<th>Parameter</th>
<th>Estimate</th>
<th>95% Confidence Limits</th>
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