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Evaluating the Accuracy of Self-Reported Build in Insurance Applications and the Role of Third-Party Evidence in Underwriting Risk

Guizhou Hu, Vice President, Head of Risk Analytics, Global Underwriting
Taylor Pickett, Vice President and Actuary
Jacqueline Waas, Vice President, Underwriting Research and Development

RGA

Underwriters frequently use height, weight, and body mass index (BMI) as critical factors in risk assessment due to build's well-established correlation with mortality. With the rise of accelerated underwriting, traditional paramedical exams, including build measurements, have been increasingly replaced by applicant disclosures and data from clinical medicine, including information found in electronic health records, medical claims, and lab results. This report explores the accuracy of self-reported data and the availability of third-party evidence, drawing on insights from two collaborative studies conducted by RGA and partner carriers.

Two research datasets

1. Analysis #1: RGA analyzed BMI data from a detailed evidence set of approximately 5,000 insurance applicants who purchased policies through a direct-to-consumer channel. The dataset included self-disclosed build information, along with build and BMI values sourced from prescription data (Rx), medical claims, and LabPiQture clinical and insurance labs. The medical claims data provided a view of both BMI values and BMI ranges via relevant ICD codes. LabPiQture provided build from past paramedical exams, when available.

Analysis #1 examined the availability and recency of build and BMI information from these sources and compared results to self-reported BMI.

2. Analysis #2: RGA conducted a retrospective study of approximately 900 life insurance cases to assess the value of digital underwriting evidence – specifically medical claims, electronic health records (EHR), and LabPiQture. Build and BMI values from these sources, along with attending physician statements (APS) and paramedical exams, were compared to self-reported build and BMI.

This analysis also examined the availability and recency of build and BMI information from these sources and compared results to self-reported build and BMI, along with evidences used in traditional full underwriting.

Methodology

Two distinct methodologies were used to evaluate differences between self-reported BMI and third-party evidence.

1. **Methodology #1:** The first approach used a confusion matrix to compare BMI categories across data sources. BMI was divided into commonly defined risk categories, and the matrix – shown in Tables 3-4, highlights the level of agreement (green diagonal cells) and disagreement (white cells) between self-reported and third-party values.
2. **Methodology #2:** The second approach estimated the mortality impact of BMI discrepancies using relative mortality risk (RR) for each BMI category (Table 1). These RRs, derived from population mortality studies, demonstrate the well-known U-shaped relationship between BMI and mortality. By applying these RRs as weights, the analysis calculated the percentage difference in overall mortality risk between self-reported and evidence-based BMI.

For example, if third-party evidence identifies a 2% higher mortality risk over self-reported BMI, this indicates the applicant under-reported their BMI. This assumes the BMI derived from third-party evidence is unbiased and accurate. The difference represents "mortality slippage" – the risk gap introduced by self-reported BMI, or as "mortality slippage recovery" when corrected by third-party BMI data.

Table 1. Relative risks by BMI categories (results from experience study)

BMI (kg/m2)	Relative Risk
<20	2.47
20 – 24.9	1.20
25 – 29.9	1.0 (Reference)
30 – 34.9	1.10
35 – 39.9	1.31
40 – 44.9	1.65
45 – 49.9	2.10
≥50	2.80

Analysis #1 Results

Analysis #1 evaluated the availability and recency of build and BMI data from medical claims and LabPiQture and compared results to self-reported BMI.

As shown in Table 2, when both medical claims and LabPiQture were available for the same individual, medical claims provided BMI data more frequently (28% v/s 13%). When further segmented, medical claims data showed slightly higher availability for females and older individuals – unsurprising, as these groups are more likely to visit healthcare providers.

Because BMI found in LabPiQture data primarily comes from historical insurance exams, its profile differs from medical claims. As a result, BMI availability was higher among males and older individuals, who are more likely to have had prior insurance coverage.

BMI values from third-party evidence consistently indicated higher mortality risk compared to self-reported BMI. This indicates that self-reported BMI tends to underestimate the risk, with mortality risk differences ranging from 5% - 9% for medical claims BMI and 1% - 3% for LabPiQture BMI (Table 2). Tables 3 and 4 show confusion matrices illustrating the discrepancies between evidence-based and self-reported BMI.

To explore the difference in mortality risk gap between medical claims and LabPiQture, we compared the recency of the BMI data (Table 5). On average, medical claims data is 1 - 2 years old, while LabPiQture BMI is 3 - 4 years old. It is reasonable to assume that older evidence may be less effective in detecting BMI underreporting.

Table 2: BMI data availability and mortality risk difference from self-reported BMI by medical claims and LabPiQture , stratified by sex and age group (Results from Study 1)

	Age, gender group	# Case with evidence hit	# and % of evidence hit contain BMI	Mortality risk difference from self-reported BMI #
Medical Claims	Total	13,065	3,714 (28%)	7%
	Female 18-34	1,405	348 (25%)	9%
	Female 35-49	2,894	931 (32%)	7%
	Female 50-64	1,429	486 (34%)	8%
	Male 18-34	1,366	303 (22%)	5%
	Male 35-49	3,828	998 (26%)	7%
	Male 50-64	2,143	648 (30%)	8%
LabPiQture	Total	7,805	1,001 (13%)	2%
	Female 18-34	999	58 (6%)	3%
	Female 35-49	1,928	179 (9%)	3%
	Female 50-64	818	90 (11%)	1%
	Male 18-34	784	100 (13%)	3%
	Male 35-49	2,148	364 (17%)	2%
	Male 50-64	1,128	210 (19%)	2%

The positive mortality risk difference indicates the mortality risk assessed by the evidence is higher than the risk assed by self-reported BMI

Table 3: Cross-table case distribution matrix (confusion matrix) comparing self-reported BMI and medical claims (MC) Data (results from Analysis #1)

		Self-Reported BMI Group								
		<20	20-24.9	25-29.9	30-34.9	35-39.9	40-44.9	45-49.9	>=50	Sub
MC BMI Group	<20	30	31	12	2	2	0	0	0	77
	20-24.9	21	405	77	6	0	0	0	0	509
	25-29.9	5	225	740	70	5	1	0	0	1046
	30-34.9	2	39	423	466	46	4	0	0	980
	35-39.9	1	16	84	219	239	16	4	0	579
	40-44.9	0	8	27	70	130	91	7	0	333
	45-49.9	0	1	12	15	37	39	17	0	121
	>=50	0	2	4	6	21	28	8	0	69
	Sub	59	727	1379	854	480	179	36	0	3714

Table 4: Cross-table case distribution matrix (confusion matrix) comparing self-reported BMI and LabPiQture (LP) data (results from Analysis #1)

		Self-Reported BMI Group								
		<20	20-24.9	25-29.9	30-34.9	35-39.9	40-44.9	45-49.9	>=50	Sub
LP BMI Group	<20	17	8	0	1	0	0	0	0	26
	20-24.9	5	184	50	0	0	0	0	0	239
	25-29.9	0	65	265	36	5	0	0	0	371
	30-34.9	1	4	88	120	14	0	0	0	227
	35-39.9	0	1	8	38	36	5	0	0	88
	40-44.9	0	0	2	6	14	17	0	0	39
	45-49.9	0	0	1	0	4	4	1	0	10
	>=50	0	0	0	0	0	1	0	0	1
	Sub	23	262	414	201	73	27	1	0	1001

Table 5: Number and percentage of cases by BMI data recency for medical claims (MC) and LabPiQture (LP) (results from Analysis #1)

Recency by years	MC	LP
<1	1340 (10%)	238 (3%)
1-2	713 (5%)	108 (1%)
2-3	1614 (12%)	128 (2%)
3-4	16 (0.1%)	105 (1%)
4-5	16 (0.1%)	124 (2%)
5-6	10 (0.1%)	109 (1%)
6-7	5 (0.04%)	97 (1%)
Total	3,714 (33%)	1001 (13%)

Analysis #2 Results

Analysis #2 evaluated the availability of build and BMI data from both traditional sources, such as paramedical exams and attending physician statements (APS), and digital underwriting evidence, such as electronic health records (EHR), medical claims, and LabPiQture, and compared results to self-reported BMI.

As shown in Table 6, aside from paramedical exams, which are considered the gold standard for current BMI measurement, APS had the highest BMI availability (93%), followed by EHR, with similar results between the two EHR vendors (75-79%).

Interestingly, BMI appeared more frequently in LabPiQture than in medical claims – opposite the trend observed in Analysis #1. This may be attributed to a greater number of insurance labs captured in LabPiQture and differences in applicant pools (traditional vs. direct to consumer). Applicants in the latter group appear to have less historical life insurance coverage, thus reducing historical lab data.

Table 6: BMI data availability from various evidence sources and mortality risk difference from self-reported BMI (results from Analysis #2)

Evidence	# Cases with evidence hit	# Hit with BMI (%)	Mortality Risk difference from self-reported BMI
Paramedical Exam	330	329 (100%)	1.7%
APS	243	225 (93%)	1.3%
EHR_vendor1	140	111 (79%)	3.2%
EHR_vendor2	132	99 (75%)	2.7%
Medical Claims	582	124 (21%)	2.0%
LabPiQture	235	67 (29%)	0%

Conclusion

Both studies demonstrate significant underreporting of BMI when relying on self-reported data, particularly within the direct-to-consumer life insurance channel. As expected, APS and EHR emerge as the closest alternatives to traditional paramedical exams. While medical claims and LabPiQture can offer some BMI information, their availability remains limited – typically 20% - 30% when data is present, Additionally, LabPiQture BMI is often sourced from historical paramedical exams that are, on average, 3 - 4 years old. This limits its effectiveness in addressing mortality slippage caused by underreported BMI.