Are General Population Utilities Appropriate to Use as Baselines for Age Adjustment of Utility Values?

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Background

- The National Institute for Health and Care Excellence (NICE) methods manual (PMG36)[1] formally recommends adjusting utility values for age in economic models using general population utility as a baseline.
- NICE Decision Support Unit (DSU) guidance (TSD12) indicates that utility estimates without a condition may be most appropriate to use as a baseline when adjusting utility values for age.[2]
- Few studies have explored the difference between general population utility and utility for people without a condition.
  - Ara and Brazier (2010)[3] conducted an analysis on patients with and without cardiovascular disease (CVD) using Health Survey England (HSE) data for 2003 and 2006 and presented in different ordinary least squares (OLS) models.
- The NICE DSU published a report on age- and sex-adjusted general population utility in the UK.[4]
  - The DSU fitted a three-component adjusted limited dependent variable mixture model (ALDVMM) to the EQ-5D-3L data from the HSE 2014 dataset.
- It is unclear whether similarities hold between general population utility and utility among people without a condition when fitting an ALDVMM, which may be a more appropriate and flexible model for EQ-5D data.

Objectives

Our research aims to:

- Investigate whether general population utility is comparable to alternative utility baselines for patients without a specific health condition, using data available from HSE EQ-5D-3L datasets.
- Compare the predictions from ALDVMM and OLS approaches in estimating baseline utility.

Methods

- The DSU's three-component ALDVMM analysis[4,5] was repeated using HSE 2014 data and HSE 2003–2014 datasets.
- OLS analysis was based on the model developed by Ara and Brazier (2010).[3] The sex variable was not included in the OLS analysis as separate models were fitted for males and females.
- All HSE datasets, accessed via UK Data Service, reporting EQ-5D-3L were considered in this analysis: HSE 2003–2006, 2008, 2010–2012, and 2014.
- The analysis was conducted in STATA version 18.
- All analyses were conducted for males and females separately.
- Five specific health conditions were investigated: CVD, diabetes, hypertension, kidney disease, and asthma.

Results

- OLS and ALDVMM regression models were fitted individually for patient groups without specific conditions (no CVD [n=46,701], no diabetes [n=70,951], no hypertension [n=58,129], no kidney disease [n=7,249], and no asthma [n=9,426]) and compared against corresponding general population utility models using available EQ-5D-3L HSE datasets.
- The mean predicted EQ-5D-3L utilities (from ALDVMM and OLS models) for patients without specific health conditions are very similar to the corresponding full HSE dataset analysis (including all patients with and without a specific health condition), as shown in **Table 1**.
- Results show a 0.3%–2.5% difference in mean predicted utilities between models without specific health conditions compared with corresponding full HSE datasets (**Table 1**), which is consistent across male and female cohorts.

Table 1. Comparisons of Models without a Health Condition and Corresponding Full HSE Dataset

		Predicted EQ-5D utility			Observed EQ-5D utility		Prediction error*	
	N	Mean	SD	Difference in mean to corresponding full HSE dataset(s)	Mean	SD	Mean	SD
Male								
ALDVMM - male (2003-2006 and 2011)	23,939	0.864	0.063	-	0.865	0.226	0.001	0.218
OLS - male (2003-2006 and 2011)	23,939	0.864	0.061	-	0.865	0.226	0.001	0.218
ALDVMM - male (no CVD; 2003-2006 and 2011)	20,427	0.878	0.055	1.6%	0.886	0.204	0.008	0.200
OLS - male (no CVD; 2003-2006 and 2011)	20,427	0.878	0.054	1.6%	0.886	0.204	0.008	0.200
ALDVMM - male (all, exc. 2008)	33,499	0.864	0.061	-	0.865	0.225	0.001	0.217
OLS - male (all, exc. 2008)	33,499	0.864	0.060	-	0.865	0.225	0.001	0.217
ALDVMM - male (no diabetes; all, exc. 2008)	30,999	0.871	0.058	0.8%	0.874	0.215	0.004	0.209
OLS - male (no diabetes; all, exc. 2008)	30,999	0.871	0.057	0.8%	0.874	0.215	0.004	0.209
ALDVMM - male (no hypertension; all, exc. 2008)	25,330	0.882	0.056	2.0%	0.889	0.202	0.007	0.196
OLS - male (no hypertension; all, exc. 2008)	25,330	0.882	0.055	2.0%	0.889	0.202	0.007	0.196
ALDVMM - male (2010 only)	3,213	0.862	0.050	-	0.860	0.216	-0.002	0.210
OLS - male (2010 only)	3,213	0.861	0.050	-	0.860	0.216	-0.001	0.210
ALDVMM - male (no kidney disease; 2010 only)	3,185	0.864	0.049	0.3%	0.862	0.214	-0.002	0.208
OLS - male (no kidney disease; 2010 only)	3,185	0.864	0.049	0.3%	0.862	0.214	-0.002	0.208
ALDVMM - male (2005 and 2010)	7,327	0.858	0.053	-	0.857	0.224	-0.001	0.218
OLS - male (2005 and 2010)	7,327	0.858	0.052	-	0.857	0.224	-0.001	0.218
ALDVMM - male (no asthma; 2005 and 2010)	4,206	0.846	0.049	-1.4%	0.844	0.224	-0.002	0.219
OLS - male (no asthma; 2005 and 2010)	4,206	0.846	0.048	-1.4%	0.844	0.224	-0.002	0.219
Female								
ALDVMM - female (2003-2006 and 2011)	30,235	0.843	0.074	-	0.840	0.238	-0.002	0.227
OLS - female (2003-2006 and 2011)	30,235	0.842	0.073	-	0.840	0.238	-0.002	0.227
ALDVMM - female (no CVD; 2003-2006 and 2011)	26,274	0.856	0.066	1.5%	0.859	0.222	0.003	0.214
OLS - female (no CVD; 2003-2006 and 2011)	26,274	0.856	0.066	1.5%	0.859	0.222	0.004	0.214
ALDVMM - female (all, exc. 2008)	42,386	0.842	0.072	-	0.841	0.239	-0.002	0.228
OLS - female (all, exc. 2008)	42,386	0.842	0.072	-	0.841	0.239	-0.001	0.228
ALDVMM - female (no diabetes; all, exc. 2008)	39,952	0.851	0.069	1.0%	0.850	0.229	-0.001	0.220
OLS - female (no diabetes; all, exc. 2008)	39,952	0.849	0.069	0.8%	0.850	0.229	0.001	0.220
ALDVMM - female (no hypertension; all, exc. 2008)	32,799	0.864	0.063	2.5%	0.869	0.214	0.005	0.207
OLS - female (no hypertension; all, exc. 2008)	32,799	0.864	0.063	2.5%	0.869	0.214	0.005	0.207
ALDVMM - female (2010 only)	4,119	0.841	0.068	-	0.840	0.239	-0.001	0.230
OLS - female (2010 only)	4,119	0.840	0.067	-	0.840	0.239	-0.001	0.230
ALDVMM - female (no kidney disease; 2010 only)	4,064	0.844	0.065	0.4%	0.843	0.235	-0.001	0.227
OLS - female (no kidney disease; 2010 only)	4,064	0.844	0.063	0.4%	0.843	0.235	0.000	0.227
ALDVMM - female (2005 and 2010)	9,216	0.833	0.072	-	0.833	0.240	-0.001	0.230
OLS - female (2005 and 2010)	9,216	0.834	0.071	-	0.833	0.240	-0.001	0.229
ALDVMM - female (no asthma; 2005 and 2010)	5,220	0.823	0.071	-1.2%	0.823	0.241	0.000	0.230
OLS - female (no asthma; 2005 and 2010)	5,220	0.824	0.071	-1.2%	0.823	0.241	-0.001	0.230

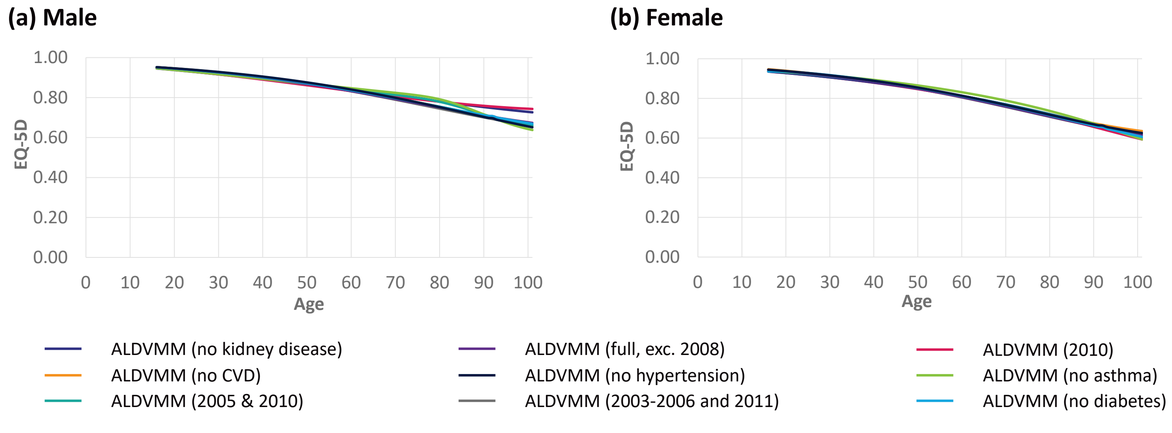
Note: *, difference between EQ-5D 3L utility prediction and observation

Abbreviations: ALDVMM, adjusted limited dependent variable mixture model; CVD, cardiovascular disease; HSE, Health Survey for England; OLS, ordinary least squares; SD, standard deviation.

Results (Cont'd)

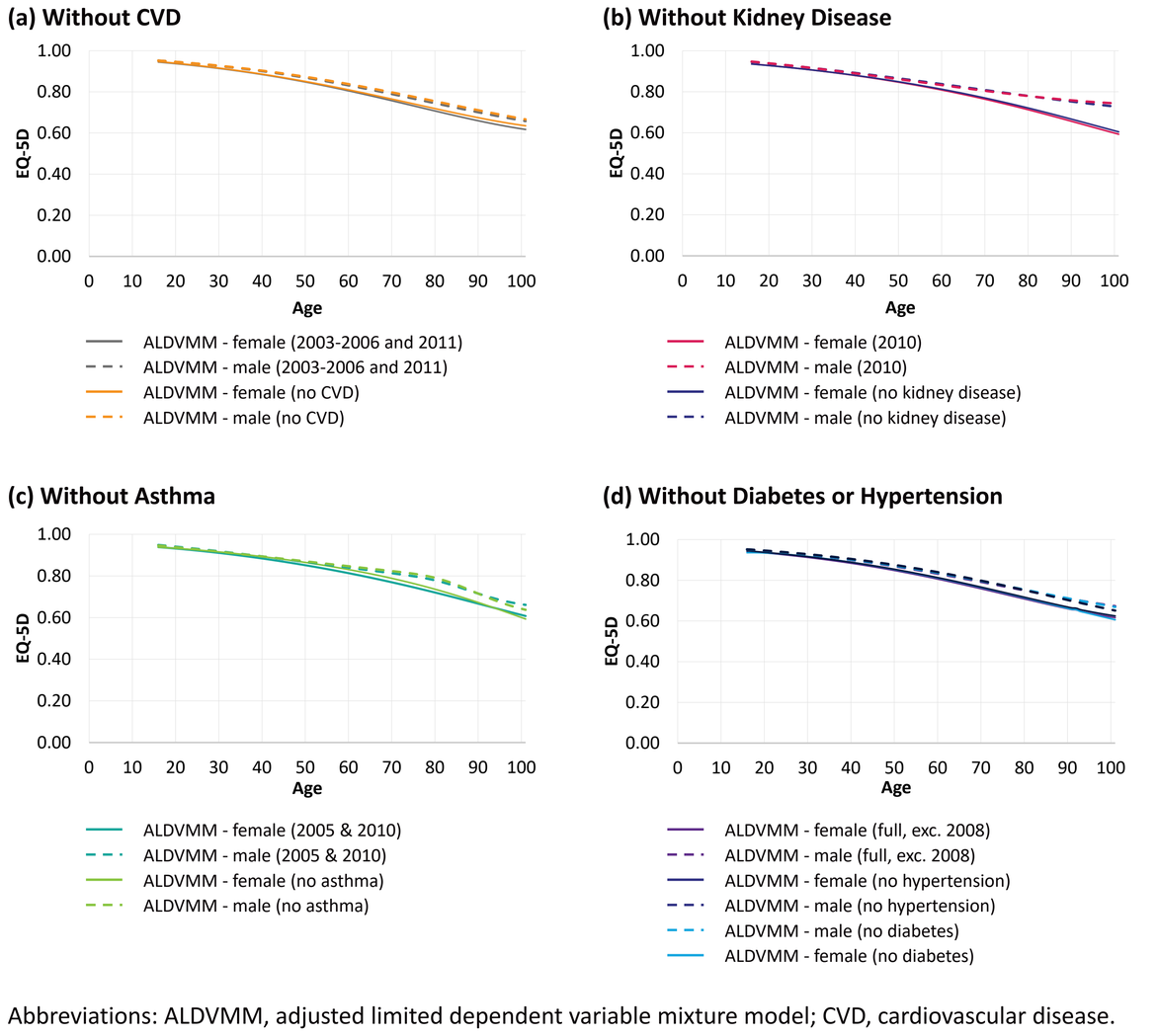
- **Figure 1** shows the comparisons in ALDVMM-predicted utilities by age across different specific health conditions and corresponding full HSE datasets. All models closely align at age 16–60 years old.
- While some differences across conditions in predicted utility were observed among the older age groups (>60 years old) in the male cohort (**Figure 1a**), this may be due to relatively limited sample sizes being available within each corresponding HSE dataset.
- **Figure 2** further investigates the comparisons of predicted EQ-5D utilities by age from ALDVMM models without each specific health condition (CVD, diabetes, hypertension, kidney disease, asthma) and corresponding full HSE datasets, indicating that the corresponding general population models are closely aligned with models without a specific health condition.
- Overall, OLS and ALDVMM models for patients without specific health conditions were similar to corresponding general population models.

Figure 1. Comparisons of ALDVMM Models without a Health Condition and Corresponding Full HSE Dataset



Abbreviations: ALDVMM, adjusted limited dependent variable mixture model; CVD, cardiovascular disease.

Figure 2. Comparisons of ALDVMM Models Without Each Specific Health Condition and Corresponding Full HSE Datasets



Abbreviations: ALDVMM, adjusted limited dependent variable mixture model; CVD, cardiovascular disease.

Conclusions

- Among the five health conditions assessed (CVD, diabetes, hypertension, kidney disease, asthma), general population utility appeared to be a reasonable proxy for utility estimates without the conditions. Results are very similar in ALDVMM and OLS analyses.
- Results indicate that use of general population utility as a baseline when adjusting utility values for age in economic models may be appropriate.
- Further validation studies are required to test this assumption across other medical conditions.

References

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