Yasser Bakhsh¹, Abdulhameed Kashkary¹, Abdullah Assiri^{1,2}, Jose Binongo², and Scott JN McNabb² ¹ Ministry of Health, Kingdom of Saudi Arabia



Introduction

- Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) was first reported in Jeddah in 2012.
- As of April 2016, there have been 1,698 cases, with 609 deaths in 26 countries (≅36% mortality)
- Hospital outbreaks, which affect patients, visitors, and healthcare workers, are major cause of concern

Objectives

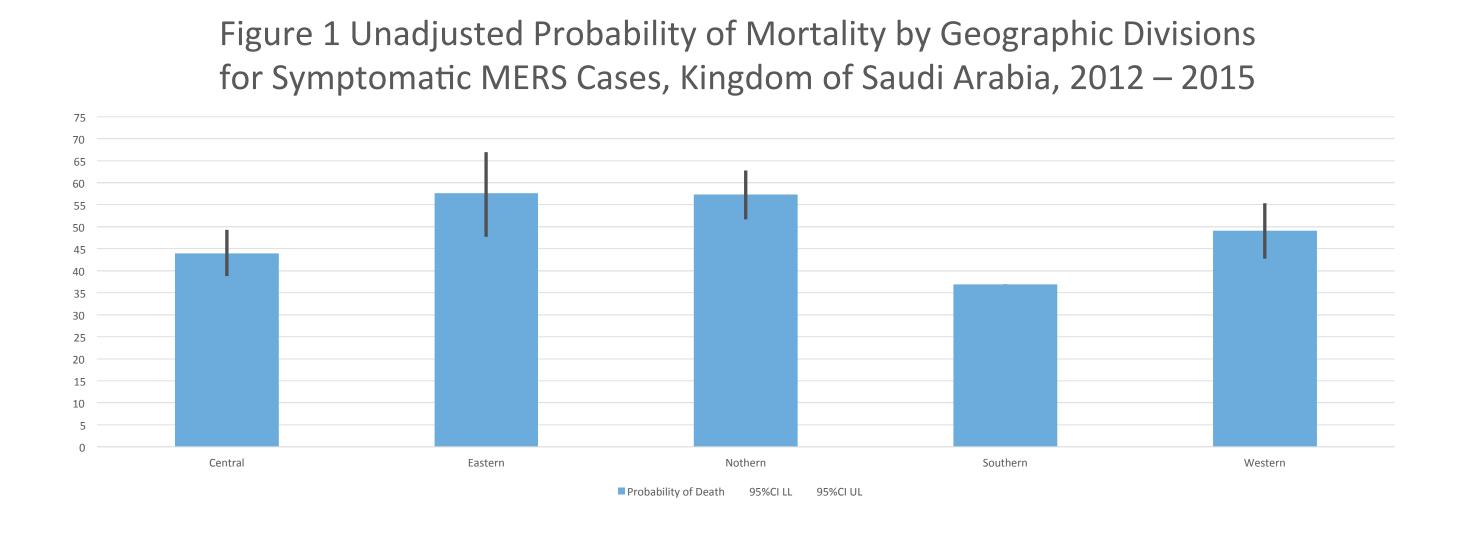
- **Describe differences in mortality rates of MERS-CoV** patients among different regions and healthcare providers
- Examine relationship between patient mortality and predictors

Mothoda

	Nethods													
		_		Division *	Variable	Level	Reference	Proba bility	95	% CI	Odds (OR)	95% C	Cl odds	P-value
Ministry of H	ealth (MoH) collected	data through	national	Center	Intercept			-	23.02	57.44	0.64	0.30	1.35	0.2378
MERS-CoV s	urvoillanco			oenter	Sector	Military	МОН	00.04	20.02	57.77	0.97	0.69	1.36	0.8701
	uivemance				000101	NG	WOTT				0.79	0.71	0.89	<.0001
						Private					1.74	0.54	5.55	0.3510
1,283 confirm	ned MERS-CoV cases	from Septem	1ber 2012 to			Other ^{\$}					0.71	0.51	0.99	0.0440
Doomhor 20	15 included	-			Age	30 to 49	less than 30				0.75	0.36	1.54	0.4307
December 20	15 included				Age	50 to 69	1633 11411 00				2.24	1.01	4.95	0.0460
		_				70 and above					2.24 5.94	2.88	4.93	
Chi-square te	ests for association of	f outcome wit	th all		Condor		Fomolo							
•					Gender	Male	Female				1.08	0.81	1.45	0.5828
predictors ar	nd cross-sectional mu	liti-level analy	/SIS to		Nationality	Saudi	Non-Saudi				0.89	0.68	1.16	0.3915
		-			Source of	Secondary case	Primary				1.04	0.63	1.72	0.8824
generalize es	stimating equations (G	aee)			Infection	hospital acquired								
		-				Secondary case					0.08	0.03	0.24	<.0001
Analyzed cas	ses as observations w	vithin hosnital	ls and			healthcare worker								
		-				Secondary case					0.14	0.05	0.34	<.0001
hospitals we	re grouped into region	ns				household contact								
						Unclassified					0.80	0.55	1.15	0.2314
				East	Intercept			18.64	5.04	49.69	0.23	0.05	0.99	0.0481
					Sector	Military	МОН			10100	1.64	0.08	34.80	0.7515
	Results				000101	NG	WOTT				0.11	0.03	0.35	0.0002
	Πσσμισ													
						Private					1.26	0.18	9.05	0.8155
						Other ^{\$}					0.26	0.08	0.85	0.0263
Overall morta	ality rate was 43%				•									
Overall morta	ality rate was 43%				Age	30 to 49	less than 30				0.44	0.07	2.58	0.3621
					Age	50 to 69	less than 30				0.44 0.62	0.07 0.19	2.03	0.3621 0.4301
	ality rate was 43% ests showed significa	nt associatio	n between		Age		less than 30						2.03	
Chi-square te	ests showed significa				Age Gender	50 to 69	less than 30 Female				0.62	0.19	2.03	0.4301
Chi-square te						50 to 69 70 and above					0.62 2.31	0.19 0.32	2.03 16.55 2.53	0.4301 0.4030
 Chi-square te mortality and 	ests showed significated sector of healthcare	provider, pati	ient's age,		Gender	50 to 69 70 and above Male	Female				0.62 2.31 1.22	0.19 0.32 0.59	2.03 16.55 2.53 21.16	0.4301 0.4030 0.5843
 Chi-square te mortality and 	ests showed significa	provider, pati	ient's age,		Gender Nationality	50 to 69 70 and above Male Saudi Secondary case	Female Non-Saudi				0.62 2.31 1.22 5.95	0.19 0.32 0.59 1.67	2.03 16.55 2.53 21.16	0.4301 0.4030 0.5843 0.0059
 Chi-square te mortality and gender, natio 	ests showed significated sector of healthcare	provider, pati	ient's age,		Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired	Female Non-Saudi				0.62 2.31 1.22 5.95 8.34	0.19 0.32 0.59 1.67 2.77	2.03 16.55 2.53 21.16 25.10	0.4301 0.4030 0.5843 0.0059 0.0002
 Chi-square te mortality and 	ests showed significated sector of healthcare	provider, pati	ient's age,		Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case	Female Non-Saudi				0.62 2.31 1.22 5.95	0.19 0.32 0.59 1.67	2.03 16.55 2.53 21.16	0.4301 0.4030 0.5843 0.0059
 Chi-square termortality and gender, nationality acquisition 	ests showed significated sector of healthcare onality, source of infector	provider, pati tion, and yea	ient's age, ar of		Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker	Female Non-Saudi				0.62 2.31 1.22 5.95 8.34 0.27	0.19 0.32 0.59 1.67 2.77 0.04	2.03 16.55 2.53 21.16 25.10 1.99	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986
 Chi-square termortality and gender, nationality and gender, nationacquisition Table 1: Descriptive A 	ests showed significated sector of healthcare onality, source of infector	provider, pati tion, and yea	ient's age, ar of		Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case	Female Non-Saudi				0.62 2.31 1.22 5.95 8.34	0.19 0.32 0.59 1.67 2.77	2.03 16.55 2.53 21.16 25.10	0.4301 0.4030 0.5843 0.0059 0.0002
 Chi-square termortality and gender, nationality and gender, nationacquisition Table 1: Descriptive A 	ests showed significated sector of healthcare onality, source of infector	provider, pati tion, and yea	ient's age, ar of		Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact	Female Non-Saudi				0.62 2.31 1.22 5.95 8.34 0.27 0.32	0.19 0.32 0.59 1.67 2.77 0.04	2.03 16.55 2.53 21.16 25.10 1.99 2.53	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779
 Chi-square termortality and gender, nationality and gender, nationacquisition Table 1: Descriptive A Syndrome, Kingdom (1996) 	ests showed significa d sector of healthcare onality, source of infect Analysis of Predictors of Morta of Saudi Arabia, 2012 – 2015:	provider, pati tion, and yea lity for Middle East (n=1283)	ient's age, ar of tern Respiratory	Woot	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case	Female Non-Saudi	16 / 1	E 10	41.26	0.62 2.31 1.22 5.95 8.34 0.27 0.32 0.32	0.19 0.32 0.59 1.67 2.77 0.04 0.04	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818
 Chi-square termortality and gender, nationality and gender, nationality and acquisition Table 1: Descriptive A Syndrome, Kingdom available 	ests showed significated sector of healthcare onality, source of infector	provider, pati tion, and yea	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified	Female Non-Saudi Primary	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.32 0.92 0.20	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126
 Chi-square termortality and gender, nationality and gender, nationality and acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age) 	ests showed significated sector of healthcare on ality, source of infection of the sector of the sec	provider, patiestion, and yea	ient's age, ar of tern Respiratory	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified	Female Non-Saudi	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.32 0.32 0.92 0.20 2.37	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001
 Chi-square termortality and gender, nationality and gender, nationality and acquisition Table 1: Descriptive A Syndrome, Kingdom available 	ests showed significated sector of healthcare onality, source of infectors of Mortated Saudi Arabia, 2012 – 2015: Levels	provider, patiestic, provider, patiestic, and yea	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified	Female Non-Saudi Primary	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.32 0.92 0.20 2.37 1.79	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182
 Chi-square te mortality and gender, natio gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender) 	ests showed significated sector of healthcare onality, source of infection of Saudi Arabia, 2012 – 2015: Levels	provider, patiestic, provider, patiestic, and yea lity for Middle East (n=1283) N (%) 826 (64.38) 457 (32.62)	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified	Female Non-Saudi Primary	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.32 0.32 0.92 0.20 2.37	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001
 Chi-square termortality and gender, nationality and gender, nationality and acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age) 	ests showed significated sector of healthcare onality, source of infection of Saudi Arabia, 2012 – 2015: Levels	provider, pati tion, and yea lity for Middle East (n=1283) N (%) 826 (64.38) 457 (32.62) 872 (67.97)	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified	Female Non-Saudi Primary	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.32 0.92 0.20 2.37 1.79	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender Nationality 	Analysis of Predictors of Morta of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi	provider, patiest tion, and yea lity for Middle East (n=1283) N (%) 826 (64.38) 457 (32.62) 872 (67.97) 411 (32.03)	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified	Female Non-Saudi Primary	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.32 0.92 0.20 2.37 1.79 1.16	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.53 2.87 0.71 3.15 4.53 2.07	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender Nationality 	Analysis of Predictors of Morta of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary	provider, patiest tion, and yea lity for Middle East (n=1283) N (%) 826 (64.38) 457 (32.62) 872 (67.97) 411 (32.03) 374 (29.15)	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified	Female Non-Saudi Primary	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.32 0.92 0.20 2.37 1.79 1.16 0.46	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender Nationality 	ests showed significated sector of healthcare onality, source of infectionality, source of infection of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital	provider, patiest tion, and yea lity for Middle East (n=1283) N (%) 826 (64.38) 457 (32.62) 872 (67.97) 411 (32.03)	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49	Female Non-Saudi Primary	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.32 0.32 0.92 0.20 2.37 1.79 1.16 0.46 1.00	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender Nationality 	Analysis of Predictors of Morta of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital acquired	provider, patiest tion, and yea lity for Middle East (n=1283) N (%) 826 (64.38) 457 (32.62) 872 (67.97) 411 (32.03) 374 (29.15) 163 (12.70)	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49 50 to 69 70 and above	Female Non-Saudi Primary	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.32 0.92 0.20 2.37 1.79 1.16 0.46 1.00 2.78 5.93	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44 1.25 2.30	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28 6.19	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998 0.0125 0.0125 0.0002
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender Nationality 	Analysis of Predictors of Morta of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital acquired Secondary case healthcare	provider, patiest tion, and yea lity for Middle East (n=1283) N (%) 826 (64.38) 457 (32.62) 872 (67.97) 411 (32.03) 374 (29.15)	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49 50 to 69 70 and above Male	Female Non-Saudi Primary MOH Iess than 30 Female	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.20 2.37 1.79 1.16 0.46 1.00 2.78 5.93 1.18	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44 1.25 2.30 0.65	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28 6.19 15.30 2.13	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998 0.0125 0.002 0.0002 0.5876
 Chi-square termortality and gender, nationality and gender, nationality and acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender) 	Analysis of Predictors of Morta of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital acquired Secondary case healthcare worker	provider, patiestion, and yea	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection Intercept Sector Age Gender Nationality	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49 50 to 69 70 and above Male Saudi	Female Non-Saudi Primary MOH Iess than 30 Female Non-Saudi	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.20 2.37 1.79 1.16 0.46 1.00 2.78 5.93 1.18 1.03	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44 1.25 2.30 0.65 0.65	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28 6.19 15.30 2.13 1.63	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998 0.0125 0.002 0.5876 0.9089
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender Nationality 	ests showed significates a sector of healthcare onality, source of infectors analysis of Predictors of Morta of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital acquired Secondary case healthcare worker Secondary case household	provider, patiest tion, and yea lity for Middle East (n=1283) N (%) 826 (64.38) 457 (32.62) 872 (67.97) 411 (32.03) 374 (29.15) 163 (12.70)	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection Intercept Sector Age Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49 50 to 69 70 and above Male Saudi Secondary case	Female Non-Saudi Primary MOH Iess than 30 Female	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.20 2.37 1.79 1.16 0.46 1.00 2.78 5.93 1.18	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44 1.25 2.30 0.65	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28 6.19 15.30 2.13	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998 0.0125 0.002 0.0002 0.5876
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender Nationality 	ests showed significates a sector of healthcare onality, source of infector analysis of Predictors of Morta of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact	provider, patiestion, and yea	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection Intercept Sector Age Gender Nationality	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49 50 to 69 70 and above Male Saudi Secondary case hospital acquired	Female Non-Saudi Primary MOH Iess than 30 Female Non-Saudi	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.32 0.92 0.20 2.37 1.79 1.16 0.46 1.00 2.78 5.93 1.18 1.03 1.62	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44 1.25 2.30 0.65 0.65 0.89	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28 6.19 15.30 2.13 1.63 2.96	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998 0.0125 0.002 0.5876 0.9089 0.1167
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender Nationality Source of Infection 	ests showed significates a sector of healthcare onality, source of infector analysis of Predictors of Morta of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified	provider, patiestion, and yea	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection Intercept Sector Age Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49 50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case	Female Non-Saudi Primary MOH Iess than 30 Female Non-Saudi	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.20 2.37 1.79 1.16 0.46 1.00 2.78 5.93 1.18 1.03	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44 1.25 2.30 0.65 0.65	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28 6.19 15.30 2.13 1.63	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998 0.0125 0.002 0.5876 0.9089
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom (Variable Age Gender Nationality Source of Infection 	ests showed significates a sector of healthcare onality, source of infector analysis of Predictors of Mortator of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital acquired Secondary case hospital acquired Secondary case household contact Unclassified Symptomatic	provider, patiestion, and yea	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection Intercept Sector Age Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49 50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case hospital acquired	Female Non-Saudi Primary MOH Iess than 30 Female Non-Saudi	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.32 0.92 0.20 2.37 1.79 1.16 0.46 1.00 2.78 5.93 1.18 1.03 1.62 0.14	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44 1.25 2.30 0.65 0.65 0.65 0.89	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28 6.19 15.30 2.13 1.63 2.96 0.28	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998 0.0125 0.002 0.5876 0.9089 0.1167 <.0001
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom a Variable Age Gender Nationality Source of Infection 	ests showed significates a sector of healthcare onality, source of infector analysis of Predictors of Mortator of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital acquired Secondary case hospital acquired Secondary case household contact Unclassified Symptomatic Asymptomatic	provider, patiestion, and yea lity for Middle East $(n=1283)$ N (%) 826 (64.38) 457 (32.62) 872 (67.97) 411 (32.03) 374 (29.15) 163 (12.70) 240 (18.71) 190 (14.81) 316 (24.63) 1130 (88.07) 153 (11.93)	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection Intercept Sector Age Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49 50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker	Female Non-Saudi Primary MOH Iess than 30 Female Non-Saudi	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.32 0.92 0.20 2.37 1.79 1.16 0.46 1.00 2.78 5.93 1.18 1.03 1.62	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44 1.25 2.30 0.65 0.65 0.89	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28 6.19 15.30 2.13 1.63 2.96	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998 0.0125 0.002 0.5876 0.9089 0.1167
 Chi-square te mortality and gender, natio acquisition Table 1: Descriptive A Syndrome, Kingdom a Variable Age Gender Nationality Source of Infection 	ests showed significates a sector of healthcare onality, source of infector analysis of Predictors of Mortator of Saudi Arabia, 2012 – 2015: Levels Male Female Saudi Non-Saudi Primary Secondary case hospital acquired Secondary case hospital acquired Secondary case household contact Unclassified Symptomatic	provider, patiestion, and yea	ient's age, ar of tern Respiratory Mean (SD)	West	Gender Nationality Source of Infection Intercept Sector Age Gender Nationality Source of	50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case healthcare worker Secondary case household contact Unclassified Military NG Private Other ^{\$} 30 to 49 50 to 69 70 and above Male Saudi Secondary case hospital acquired Secondary case hospital acquired	Female Non-Saudi Primary MOH Iess than 30 Female Non-Saudi	16.41	5.18	41.36	0.62 2.31 1.22 5.95 8.34 0.27 0.27 0.32 0.92 0.20 2.37 1.79 1.16 0.46 1.00 2.78 5.93 1.18 1.03 1.62 0.14	0.19 0.32 0.59 1.67 2.77 0.04 0.04 0.29 0.05 1.79 0.71 0.65 0.31 0.44 1.25 2.30 0.65 0.65 0.65 0.89	2.03 16.55 2.53 21.16 25.10 1.99 2.53 2.87 0.71 3.15 4.53 2.07 0.67 2.28 6.19 15.30 2.13 1.63 2.96 0.28	0.4301 0.4030 0.5843 0.0059 0.0002 0.1986 0.2779 0.8818 0.0126 <.0001 0.2182 0.6257 <.0001 0.9998 0.0125 0.002 0.5876 0.9089 0.1167 <.0001

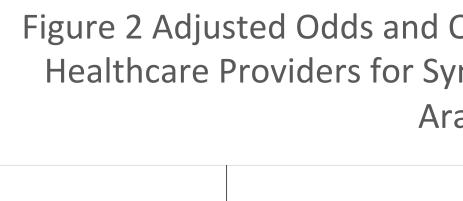
MERS-CoV Mortality by Region and Healthcare Provider, Kingdom of Saudi Arabia, 2012 – 2015

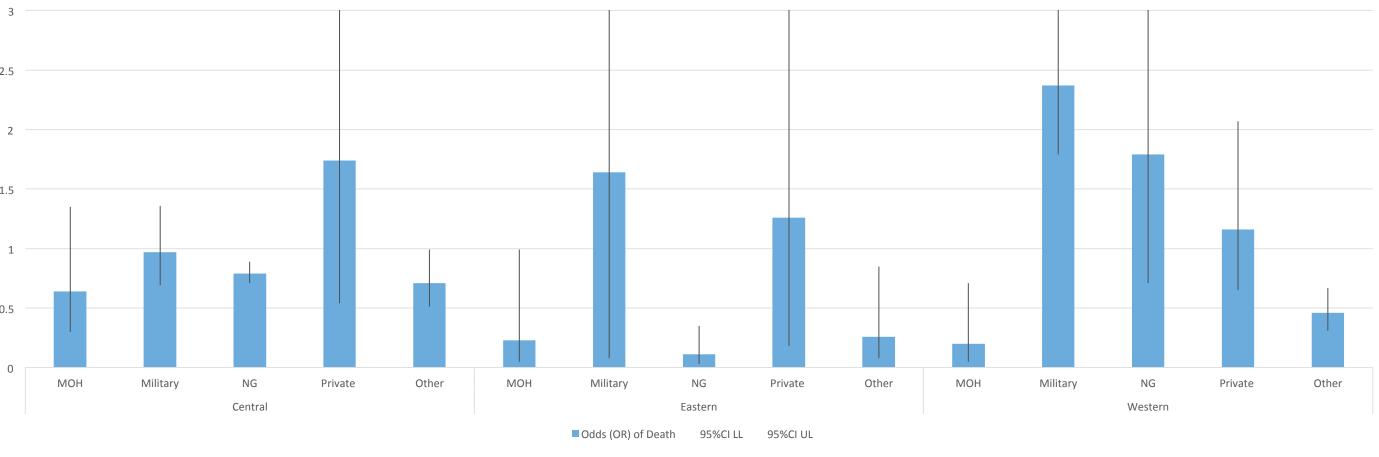
² Rollins School of Public Health, Emory University, Atlanta, GA, USA



Probability of death for symptomatic patients in MoH hospitals (adjusted for age, gender, nationality, and infection source) was 39% in Central division, 19% in Eastern division, and 16% in Western division

Table 4: Adjusted Analysis of Generalized Estimating Equations Probability of Mortality, Odds of Mortality, and Odds Ratios by Geographic Divisions for Symptomatic Middle Easters Respiratory Syndrome Cases, Kingdom of Saudi Arabia, 2012 – 2015 (n=1130, alpha=0.05 for CI and p-value)





- healthcare provider sectors
- mortality in all regions
- across healthcare providers

Recommendations

- enforced.
- and these should be equally maintained.
- advisory board should be reported.

Acknowledgements

I would like to thank Dr. Jose Binongo, Dr. Abdullah Assiri, and **Dr. Scott McNabb and the KAFP team for their continuous** support.



EM()RY

ROLLINS

SCHOOL OF

PUBLIC

HEALTH

Figure 2 Adjusted Odds and OR of Mortality by Geographic Divisions and Healthcare Providers for Symptomatic MERS Cases, Kingdom of Saudi Arabia, 2012 – 2015

Discussion

Discrepancies were observed in probability of death for MERS-CoV patients across different divisions and

Patient age and source of infection are strong predictors of

Conclusion

Several factors play a role in mortality of MERS-CoV patients, but gaps in outbreak surveillance and case reporting limit a full understanding of these

Observed results reflect variability in standard of care

Infection control and prevention has proven to be a meaningful factor in limiting MERS-CoV outbreaks

To improve data availability and integrity, strict compliance of healthcare providers to case reporting should be

MoH should set, supervise, and assure MERS-CoV standards of care across all types of healthcare providers,

Lack of compliance to protocols issued by the scientific