Understanding clinical outcomes of hospital admission:

Why it is important to document key clinical signs

Ministry of Health
KEMRI-Wellcome Trust Programme, Nairobi
Kenya Paediatric Association
& Participating hospitals

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Outline

- Mortality as a measure of quality
- Background to the CIN data for mortality reporting
- Risk factors for mortality
- Variation in mortality and risk factors
- Summary

Does mortality assess quality?

- Using mortality as an indicator of quality of care across hospitals, is contested because mortality can be affected by the case-mix of patients attending a facility or the severity of illness on arrival (case-severity)

- Case-mix – what type of patients a hospital sees, eg % with malaria or HIV

- Case-severity – how ill are patients on arrival

Does mortality assess quality?

- For example, survival of a child with pneumonia may be influenced by:
  - How advanced the illness is on arrival (hypoxic; AVPU<A)
  - The pathogen causing the illness and co-factors (eg. nutritional status)
  - **The care: antibiotics, fluids, oxygen, feeds etc – the only things a hospital can control**

- If you just examine 'crude hospital mortality' – without making efforts to account for case-mix and case-severity you have a poor indicator of quality

Is mortality useful at all?

- If hospital mortality varies across hospitals and this is because of case-mix and case-severity then it may indicate inequalities in population health, access or resource provision that can be addressed

- Hospital mortality data can therefore inform planning for health interventions and may help optimize resource allocation if they are reliable and appropriately interpreted.

- However such data and good analysis are often not available in low income countries including Kenya

- With CIN we are developing methods for this

What data are available

- CIN data September 2013 – March 2015
  - 44314 observations -12 hospitals
  - 33 741 (76%) admissions for children aged 2 – 59 months
  - 26 324 admissions with comprehensive data – excludes burns and surgical cases

- Exclude
  - 1 atypical hospital
  - 1 hospital with inconsistent data

Characteristics of the hospital

Hospital	Bed capacity	Duration of data collection in months	Cases available for analysis –minimum dataset	Cases available for analysis –full dataset	Diarrhoea admissions	Pneumonia admissions	Malaria admissions	PMTCT HIV prevalence	Percentage living in poverty in the county
A	67	18	4757	2081	1659 (34.9)	2351 (49.4)	108 (2.3)	5.5	26
B	35	18	1853	1685	446 (24.1)	1029 (55.5)	65 (3.5)	2.5	56
C	41	18	3517	1989	1063 (30.2)	1650 (46.9)	317 (9.0)	3.6	21
G	42	18	2445	2217	747 (30.6)	1420 (58.1)	210 (8.6)	3.3	21
E	29	13	1982	1774	436 (22.0)	1057 (53.3)	138 (7.0)	2.9	25
F	63	13	2440	2215	663 (27.2)	1379 (56.5)	252 (10.3)	2	41
G	32	13	1881	1726	391 (20.8)	886 (47.1)	10 (0.5)	1.4	31
H	29	13	2146	1767	531 (24.7)	548 (25.5)	1238 (57.7)	9.2	45
I	35	17	4175	3812	1106 (26.5)	1224 (29.3)	3640 (87.2)	2.5	59
J	21	17	2209	1729	267 (12.1)	504 (22.8)	1416 (64.1)	2.5	40
K	32	17	3066	2454	474 (15.5)	867 (28.3)	2020 (65.9)	2	65
L	38	17	3270	2875	967 (29.6)	1433 (43.8)	1993 (60.9)	0.3	49

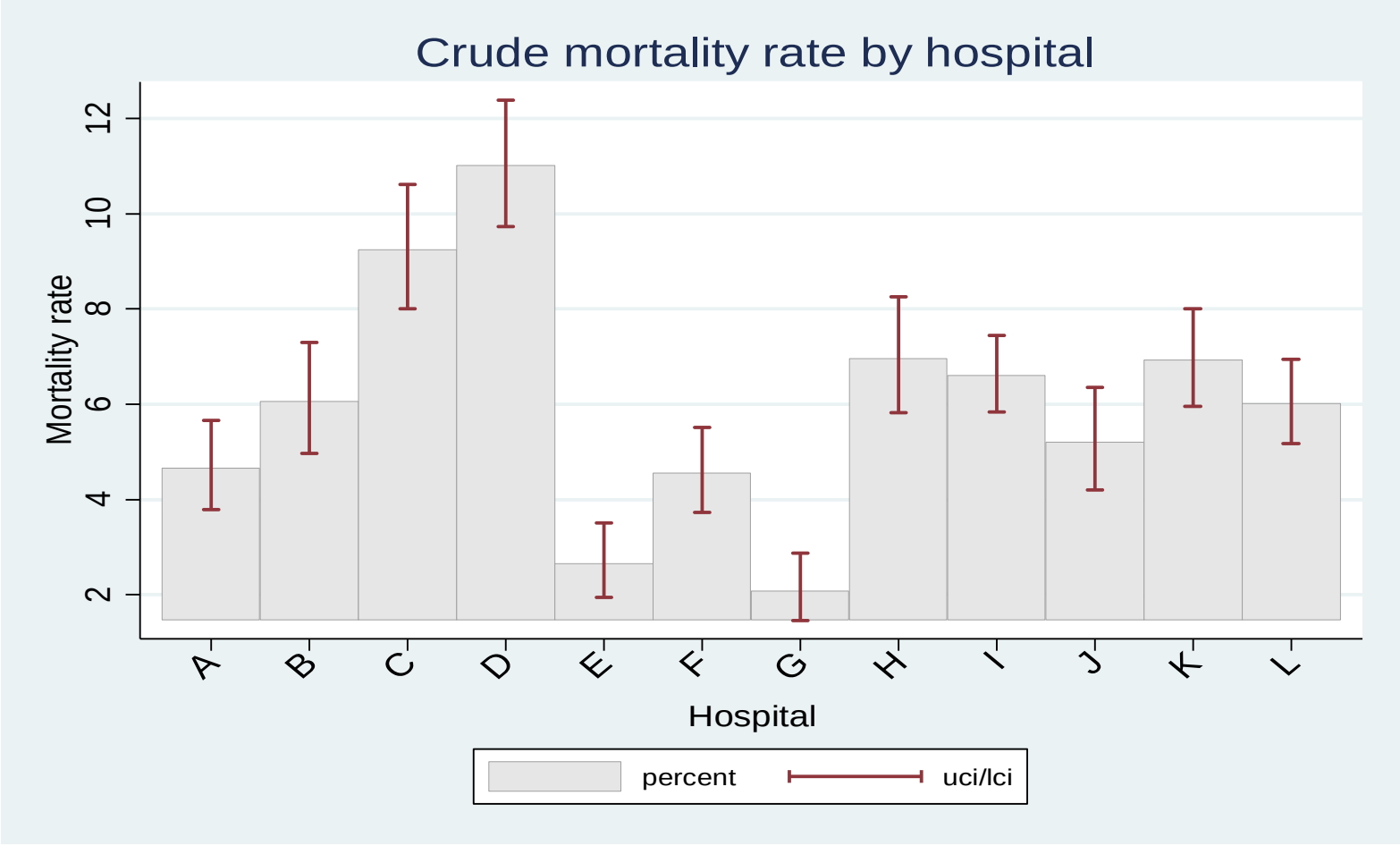
Risk factors for mortality - PAR

Length of Illness		days
Fever – No. of days =	Y☐	N☐
Cough – No. of days =	Y☐	N☐
Cough > 2 weeks	Y☐	N☐
Difficulty breathing	Y☐	N☐
Diarrhoea No. of days =	Y☐	N☐
Diarrhoea > 14d	Y☐	N☐
Diarrhoea bloody	Y☐	N☐
Vomiting, No / 24hrs –	Y☐	N☐
Vomits everything	Y☐	N☐
Difficulty feeding	Y☐	N☐
Convulsions: No. =	Y☐	N☐
Partial / focal fits?	Y☐	N☐

General Examination				
Thrush Y☐ N☐ Lymph N > 1cm Y☐ N☐				
Wrist / Rib signs Rickets Y☐ N☐				
Jaundice		0	+	+++
Oedema	☐None ☐Foot ☐Knee ☐Face			
Visible severe wasting			Y☐	N☐
A	Stridor		Y☐	N☐
B	Central Cyanosis		Y☐	N☐
	Indrawing		Y☐	N☐
	Grunting		Y☐	N☐
	Acidotic breathing		Y☐	N☐
	Wheeze		Y☐	N☐

C & Dehy dr'n	Crackles			Y☐	N☐
	Peripheral Pulse	☐ Normal		☐ Weak	
	Cap Refill	secs		*X = not possible*	
	Pallor / Anaemia	0		+	+++
	Skin warm at:	☐Hand ☐Elbow ☐Shoulder			
	Sunken eyes			Y☐	N☐
	Skin pinch (sec)		0	1	≥ 2
D	AVPU	A	V	P	U
	Can drink / breastfeed?			Y☐	N☐
	Stiff neck			Y☐	N☐

Crude mortality



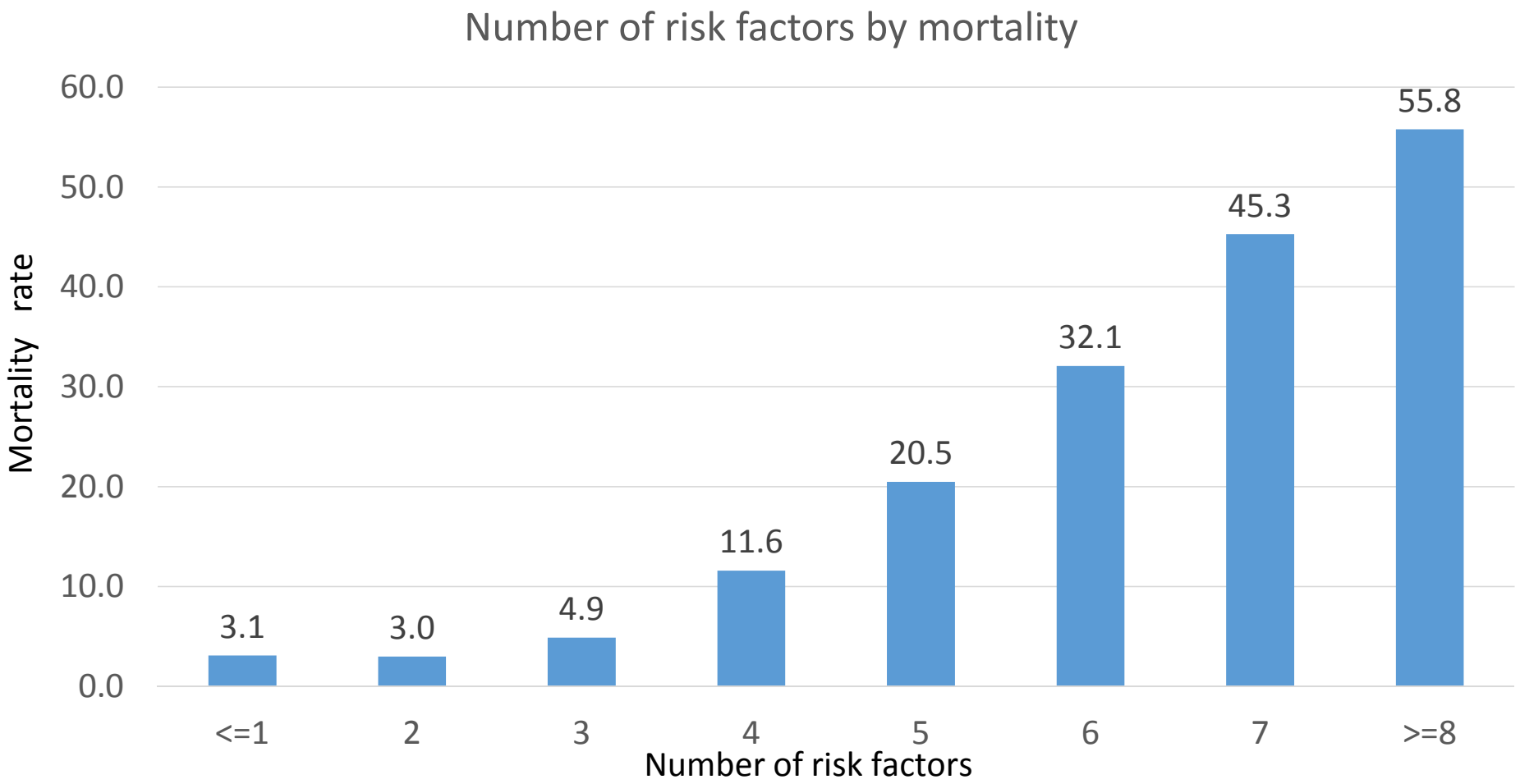
Risk factors are associated with mortality

		OR (95 CI)	P value
Child sex	Female	ref	
	Male	0.79(0.72-0.86)	<0.001
History of fever	No	ref	
	Yes	0.96(0.84-1.10)	0.555
Vomit everything	No	ref	
	Yes	1.41(1.25-1.58)	<0.001
Indrawing	No	ref	
	Yes	2.84(2.55-3.18)	<0.001
Pallor	none	ref	
	(mild/moderate)	3.39(3.03-3.79)	<0.001
Central cyanosis	No	ref	
	Yes	6.36(4.54-8.90)	<0.001
AVPU	Alert	ref	
	Not alert (VPU)	8.95(7.88-10.17)	<0.001
Ability to drink	No	ref	
	Yes	0.23(0.20-0.26)	<0.001
skin pinch	Immediate	ref	
	1 -2 secs	2.25(1.96-2.59)	<0.001
	> 2 secs	6.18(5.28-7.24)	
Severe wasting	No	ref	
	Yes	5.01(4.32-5.81)	<0.001

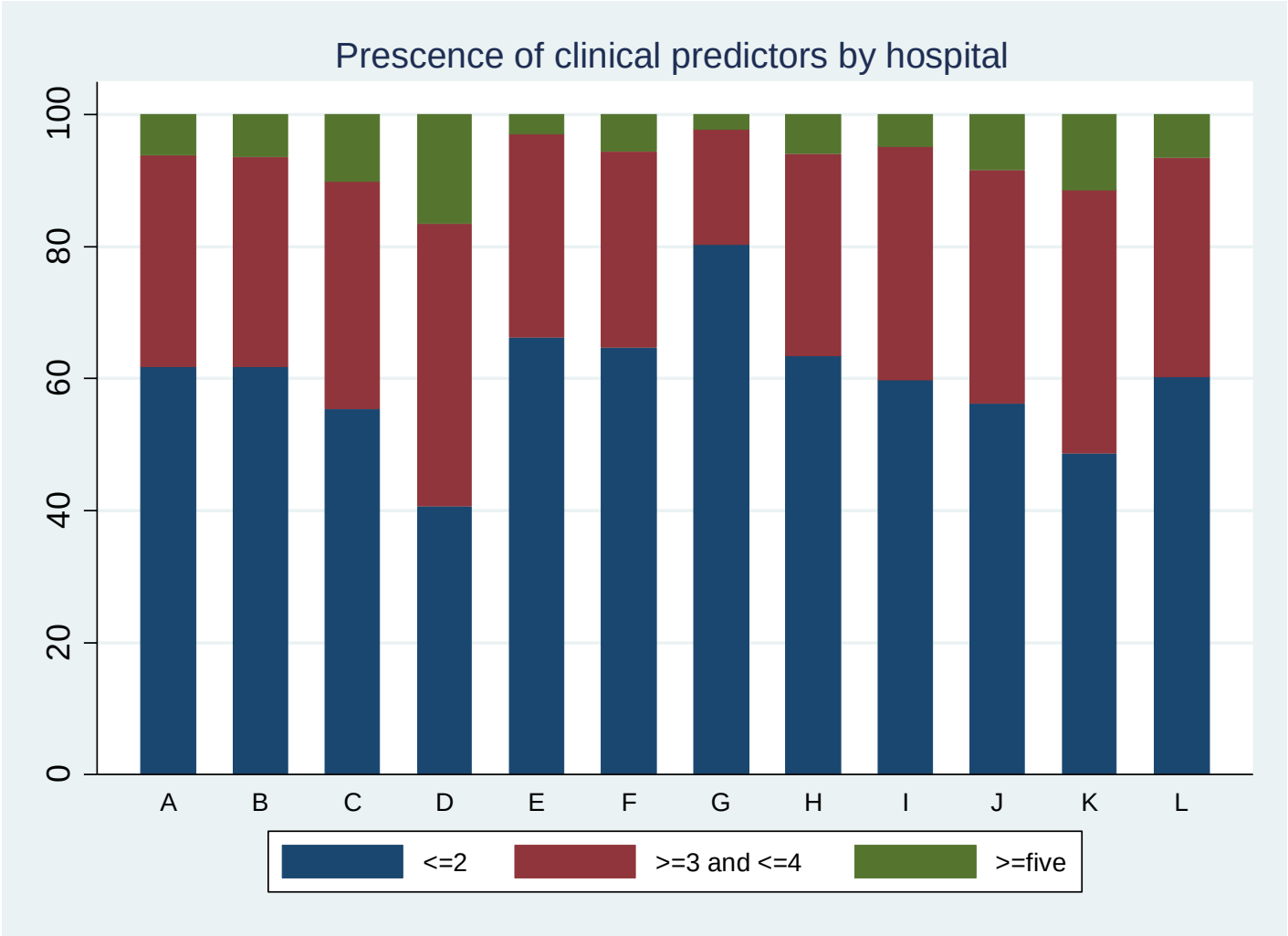
Available data by risk factor and hospital

Hospitals		A	B	.....	F	G	H	I	J	K	L	All hospitals
Observations available		2014	1689		2135	1724	1743	3806	1728	2454	2875	26153
Indrawing												
	Empty	40 (2.0)	64 (3.8)		88 (4.0)	25 (1.5)	722 (41.4)	880 (23.1)	541 (31.3)	149 (6.1)	115 (4.0)	2371(11.0)
	No	1277 (63.4)	994 (58.9)		1199 (54.6)	1334 (77.4)	852 (48.9)	2526 (66.4)	935 (54.1)	1904 (77.6)	2065 (71.8)	15254(62.2)
	Yes	697 (34.6)	631 (37.4)		908 (41.4)	365 (21.2)	169 (9.7)	400 (10.5)	252 (14.6)	401 (16.3)	695 (24.2)	7027(26.9)
Ability to drink												
	Empty	152 (7.5)	175 (10.4)		216 (9.8)	92 (5.3)	862 (49.5)	1039 (27.3)	639 (37.0)	258 (10.5)	241 (8.4)	4074(15.6)
	No	213 (10.6)	225 (13.3)		215 (9.8)	160 (9.3)	167 (9.6)	205 (5.4)	260 (15.0)	422 (17.2)	307 (10.7)	3577(13.7)
	Yes	1649 (81.9)	1289 (75.3)		1764 (80.4)	1472 (85.4)	714 (41.0)	2551 (67.3)	829 (48.0)	1774 (72.3)	2327 (80.9)	18502(70.7)
Capillary refill time												
	Empty	261 (13.0)	258 (15.9)		233 (10.6)	517 (30.0)	1144 (65.6)	1733 (45.5)	710 (41.1)	601 (24.5)	283 (9.9)	6752(25.8)
	<=2 scs	1649 (81.9)	1200 (71.0)		1652 (75.3)	1194 (69.3)	479 (27.5)	1916 (50.3)	896 (51.9)	1684 (68.6)	2276 (80.0)	15888(64.7)
	>=2 secs	101 (5.0)	128 (7.6)		149 (6.8)	11 (0.6)	111 (5.4)	111 (2.9)	95 (5.5)	161 (6.5)	279 (9.8)	1431(5.5)
	Indeterminate	2 (0.1)	93 (5.5)		161 (7.3)	2 (0.1)	9 (0.5)	46 (1.2)	26 (1.5)	8 (0.3)	7 (0.2)	1049(4.0)

Association – number of risk factors and mortality



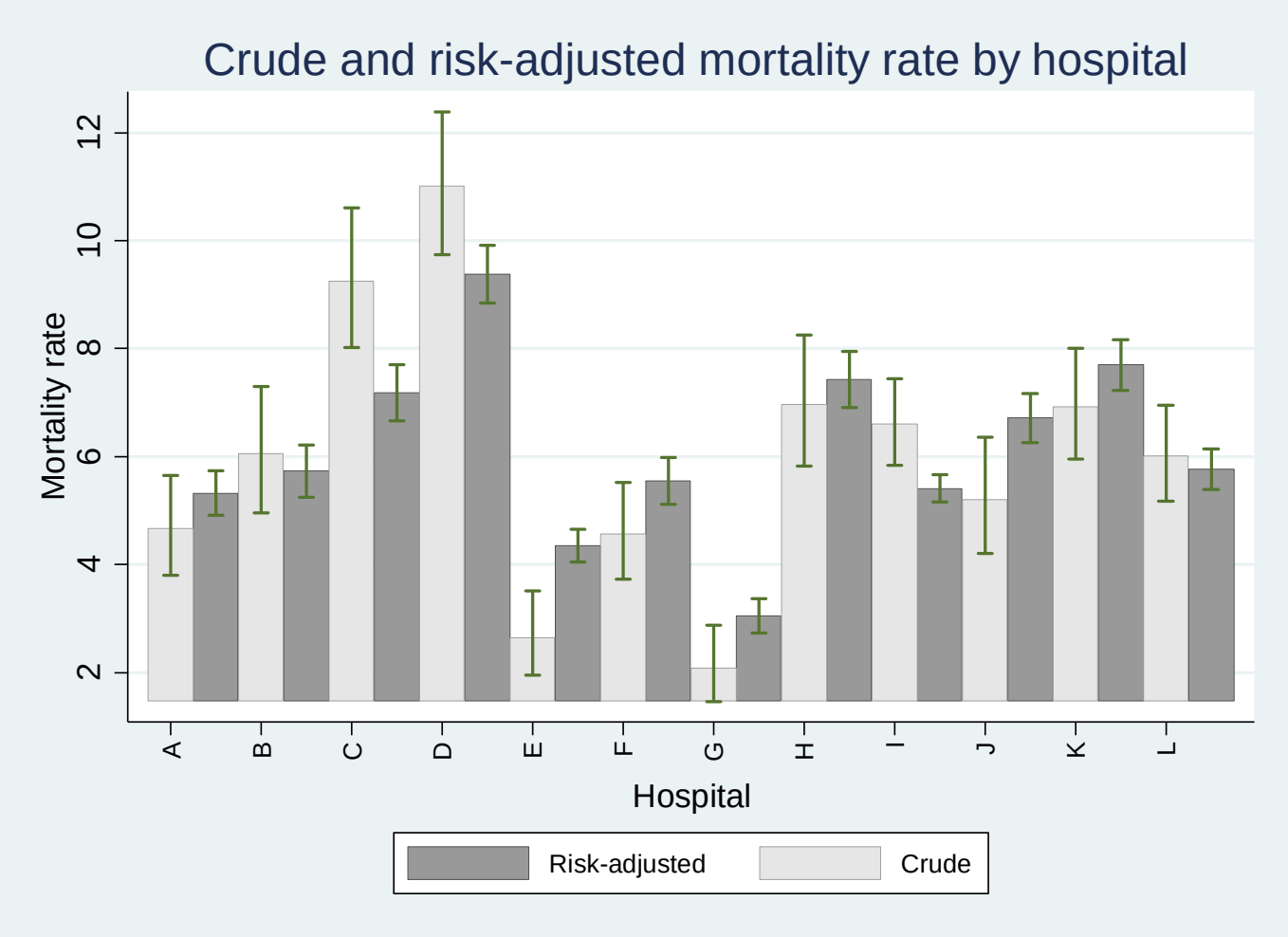
Risk factor density by hospital



Understanding risk adjustment and prediction

			severe wasting	Indrawing
AVPU		OR (95% CI)	OR (95% CI)	OR (95% CI)
	Alert	1.0		
	Verbal response	4.7 (3.7 - 6.1)	25.2 (18.3 - 34.6)	57.2 (40.3 - 81.0)
	Pain response	9.7 (8.2 - 11.4)	54.0 (42.0 - 69.5)	120.0 (90.0 - 160.1)
	Unresponsive	17.3 (13.4 - 22.3)	90.8 (64.5 - 127.8)	193.1(132.7 - 280.7)
Severe Wasting				
	No	1.0		
	Yes	5.0 - 4.3 - 5.8)		
Indrawing				
	No	1.0		
	Yes	2.8 (2.5 - 3.2)	12.2 (10.0 - 14.8)	

Hospital comparison based on outcome



Discussion (1)

- All-cause mortality is highly variable across only 12 hospitals even within a common age group.
- Variation in mortality was associated with the proportion of children with multiple risk factors
- Other associations of mortality with hospital identity are likely for underlying risk factors (such as malaria and HIV prevalence, socio-economic status, nutrition and access) that influence case-mix and case-severity.
- Mortality may potentially be influenced by differing availability of resources across hospitals and variation in care practices

Discussion (2)

- Majority of clinical risk factors on PAR were associated with mortality.
- Better high quality of data are essential to allow a better understanding and prediction of mortality.
- Need to increase the number of hospitals with good quality data (linked to us of PAR) as this will improve understanding and national level health information
- Key clinical factors can be integrated into EMRs
- The same could be done for neonatal care

Questions?

Acknowledgements

Clinical Information Network contributors include: Morris Ogero; Thomas Julius; Boniface Makone; Mercy Chepkirui; Wycliffe Nyachiro & James Wafula (KEMRI-Wellcome Trust Research Programme); Samuel N'gar N'gar (Vihiga County Hospital), Nick Aduro (Kakamega County Hospital), Loice Mutai & David Kimutai (Mbagathi County Hospital), Caren Emadau, Cecilia Mutiso & Celia Muturi (Mama Lucy Kibaki County Hospital), Charles Nzioki (Machakos County Hospital), Francis Kanyingi & Agnes Mithamo (Nyeri County Hospital), Margaret Kuria (Kisumu East County Hospital), Sam Otido & Anne Kamunya (Embu County Hospital), Alice Kariuki (Karatina County Hospital), Peris Njiiri (Kerugoya County Hospital), Rachel Inginia & Melab Musabi (Kitale County Hospital), Barnabas Kigen (Busia County Hospital), Grace Ochieng & Lydia Thuranira (Kiambu County Hospital). Rachel Nyamai (Ministry of Health). David Githanga & Fred Were (Kenya Paediatric Association).