# Preliminary findings of a three-year retrospective study of the dynamics in red offal condemnation at a cattle abattoir Q in Namibia

**By**

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# Background

- Namibian agriculture = 10-11.7% of GDP
- Commercial sector = 85% of Namibian agriculture
- Lucrative beef market = EU, UK, Norway and China
- Namibian meat inspection follows Meat Safety of RSA Act guidelines
- Provision of wholesome, attractive and safe meat
- Importance of abattoir data
  - ✓good epidemiological tool
  - ✓Detection and control of zoonotic diseases

# Significance of study

- To salvage valuable demographic, epidemiological information which is otherwise locked up in annual reports
- Expose risk factors associated with red offal condemnations at a Namibian abattoir
- To publish information on abattoir condemnations to act as a reference point for future studies, beef producers and policy makers in Namibia
- To highlight the financial implications of diseases and conditions responsible for red offal condemnations in a Namibian setting

# Objectives

- **Overall objectives**
  - ✓To investigate the monthly, seasonal and annual condemnation of red offal at a Namibian abattoir
- **Specific objectives**
  - ✓To investigate the association of monthly, seasonal and annual patterns with the most common causes of red offal condemnation
  - ✓To investigate the association of monthly, seasonal and annual patterns with the most common organ/offal condemnation

# Literature review

- General reasons for offal condemnation
  - ✓Developmental, degenerative, inflammatory or neoplastic lesions
  - ✓Infectious conditions (viral, bacterial and parasitic)
  - ✓Non-infectious conditions (traumatic, neoplastic and contamination)
- Major reported reasons for offal condemnation
  - ✓Parasitic, bacterial and traumatic
- Monthly, seasonal and yearly patterns observed in condemnations due to bacterial and parasitic diseases
- Major reported organ/offal condemnation
- Liver (fasciola, echinococcosis, abscesses, cirrhosis, jaundice, discoloration)
- Lungs (pneumonia, echinococcosis, emphysema, congestion, abscesses)

# Limitations

- Myriad reasons for condemnation leads to complicated statistical analyses with unclear inferences
- Classification of offal too variable between countries

# Delimitations

- Reasons for condemnation were grouped into designated categories to facilitate statistical analysis
- All assumptions on offal classification adopted in this study were stated within the methodology

# Methodology

- **Slaughter procedure**
- **Classification of offal**
  - ✓ Red offal (head, tongue, heart, lung, livers and kidneys)
  - ✓ White offal (brain, spine, bone marrow, testicles and udder)
  - ✓ Green offal (forestomach, abomasum, trimmings, fat, intestines and bladder)
- **Designated pathological categories**
  - ✓ Contamination
  - ✓ Infections
  - ✓ Inflammation
  - ✓ Miscellaneous
- **Temporal categories**
  - ✓ Years
  - ✓ Months
  - ✓ Seasons
- **Enumeration and tallying of recorded data**
- **Statistical analysis**
  - ✓ Descriptive
  - ✓ Inferential (Chi square, Z-test, significance level; $p \leq 0.05$)

# Results

- **Overall** proportional **annual** distribution of **red offal** condemnation
- **Overall** proportional **monthly** distribution of condemned **red offal**
- Proportional **annual** distribution of condemned **red offal**
- Proportional **seasonal** distribution of condemned **red offal**
- Proportional **annual** red offal condemnation according to **causal category**
- Proportional **monthly** red offal condemnation according to **causal category**
- Proportion **seasonal** red offal condemnation according to **causal category**
- Proportional **annual** distribution of causes for **liver condemnations**
- Proportional **seasonal** distribution of causes for **liver condemnations**
- Proportional **annual** distribution of causes for **lung condemnations**
- Proportional **seasonal** distribution of causes for **lung condemnations**

Figure 1: Annual proportional total distribution of slaughter and red offal condemnation

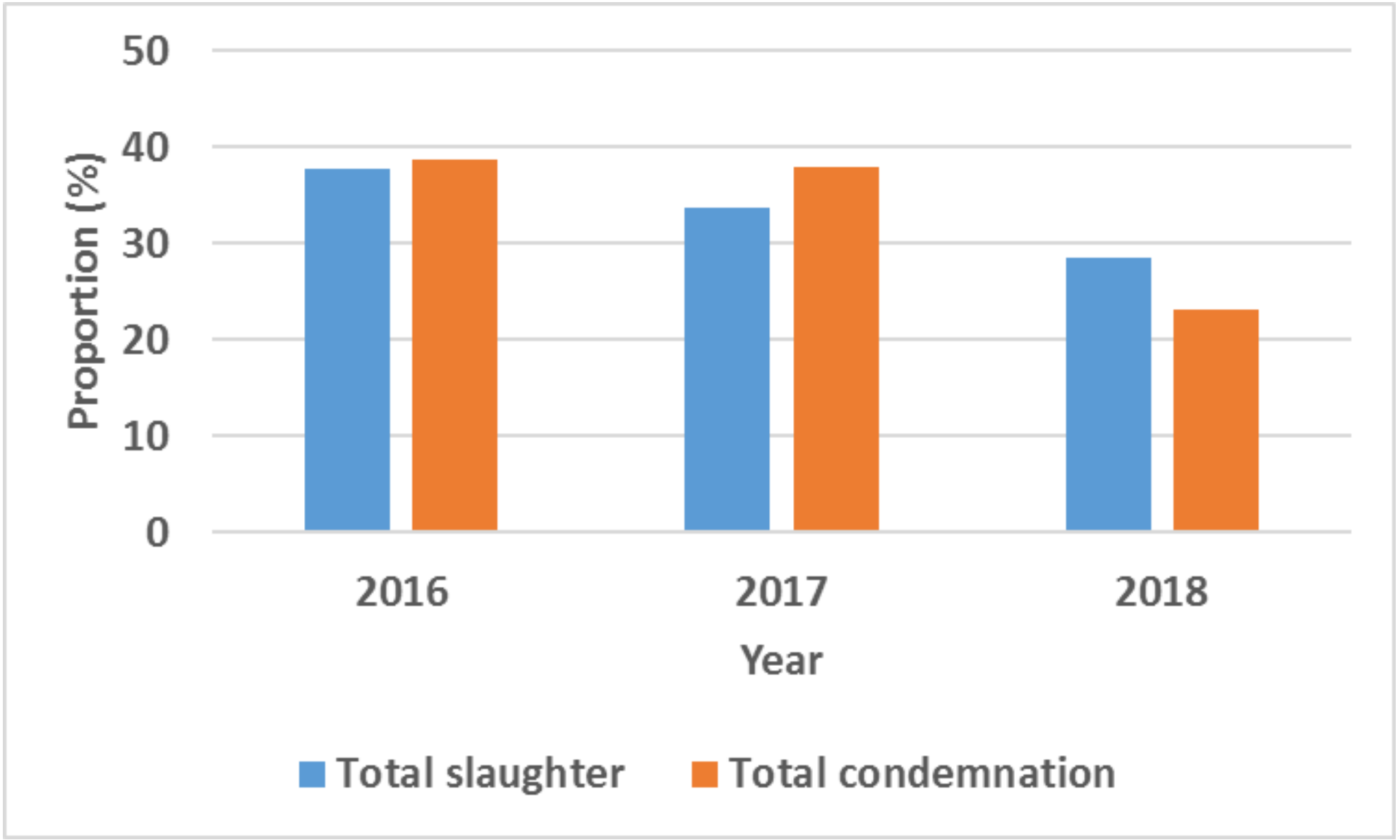
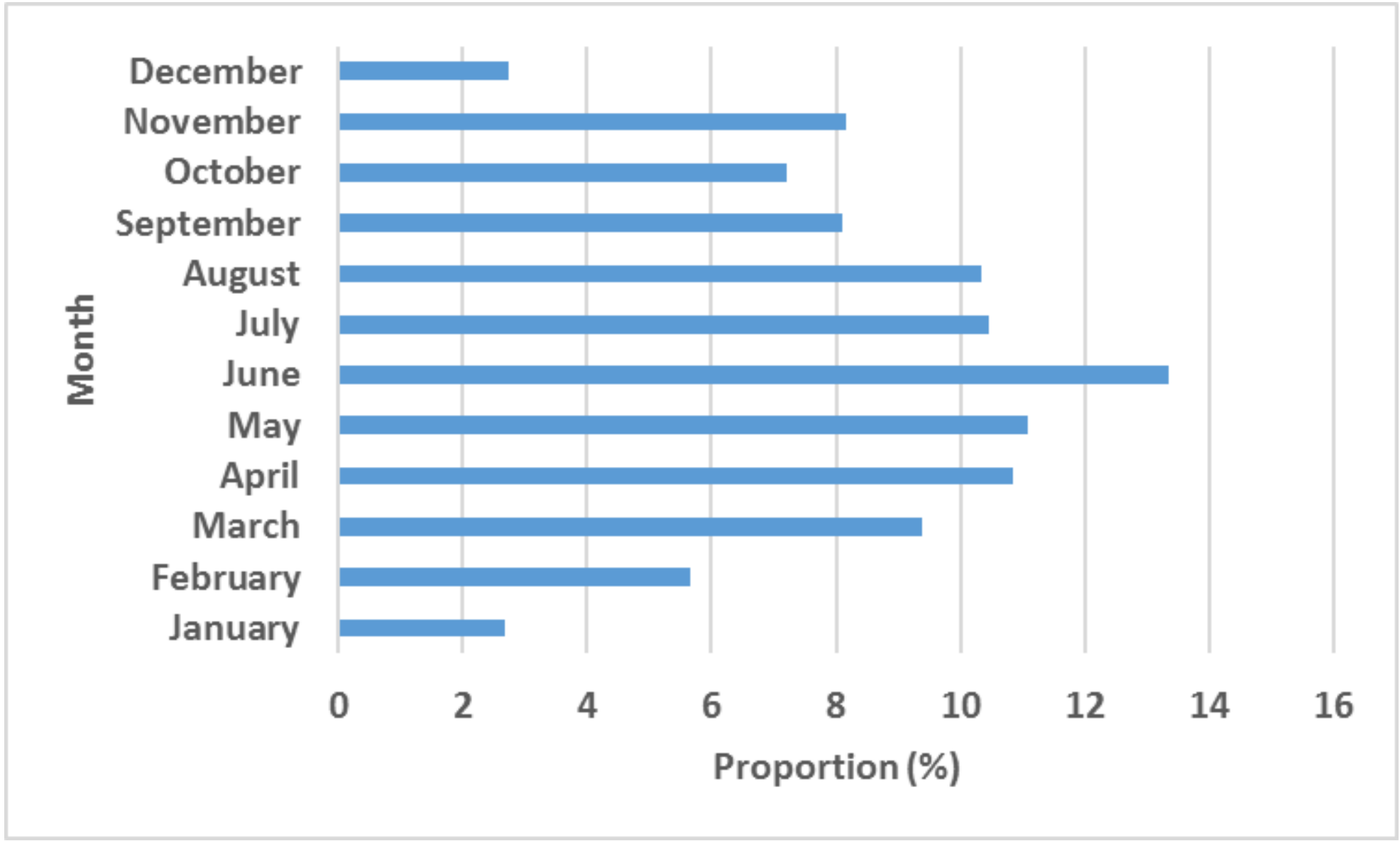


Figure 2: Overall monthly proportional distribution of condemned red offal



# Figure 3: Proportional annual distribution of condemned red offal

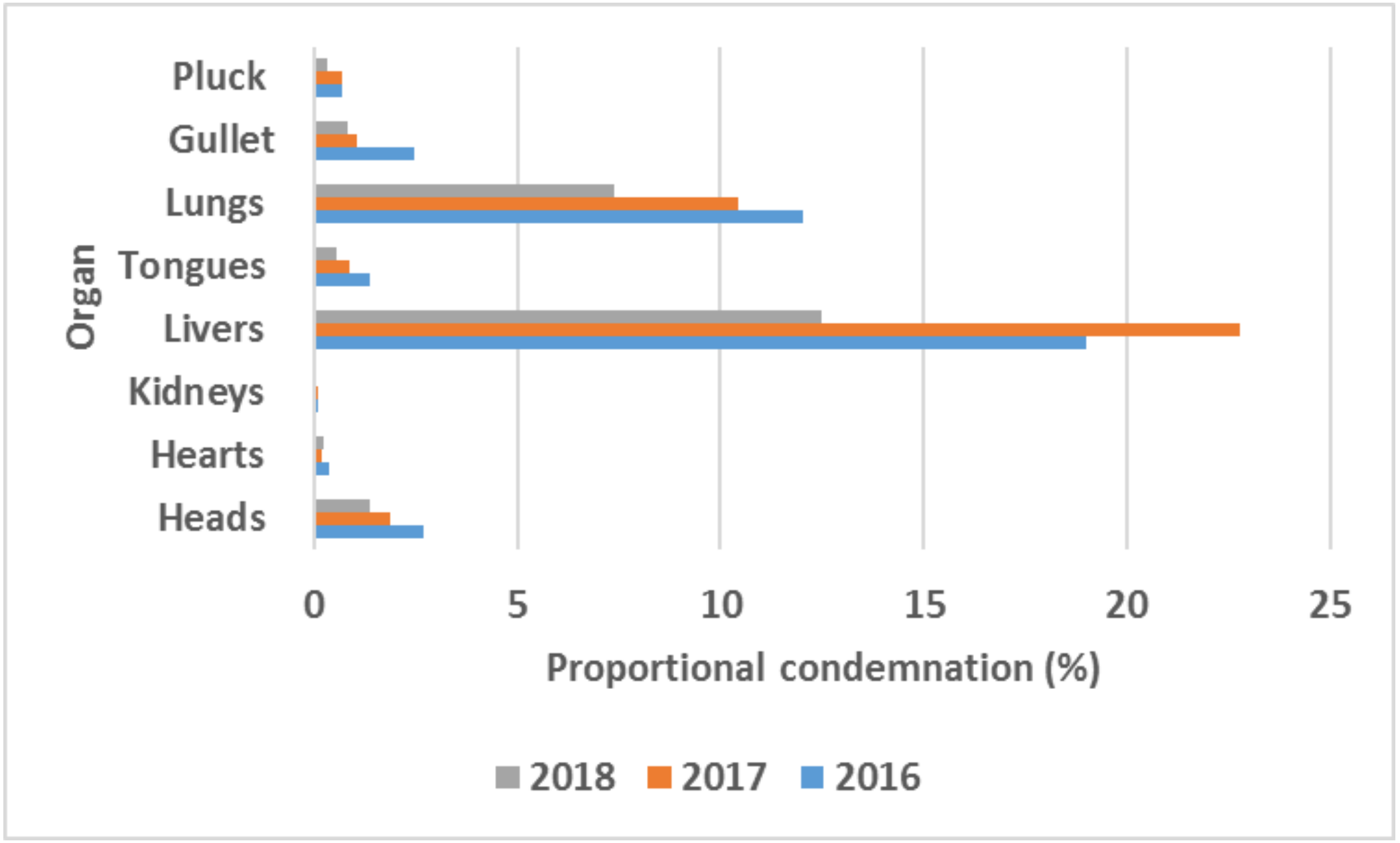


Figure 4: Seasonal distribution of organ condemnations from 2016 to 2018

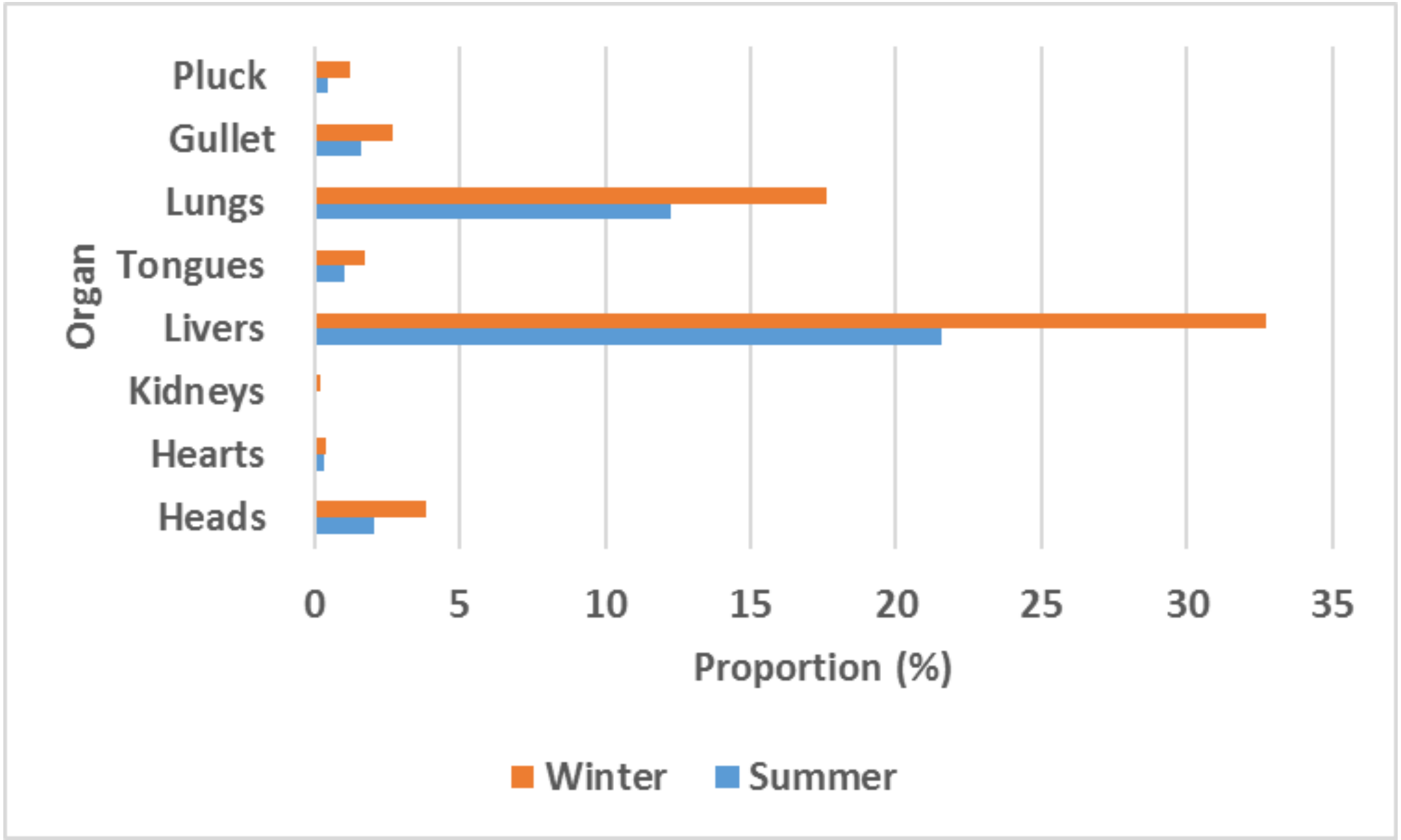
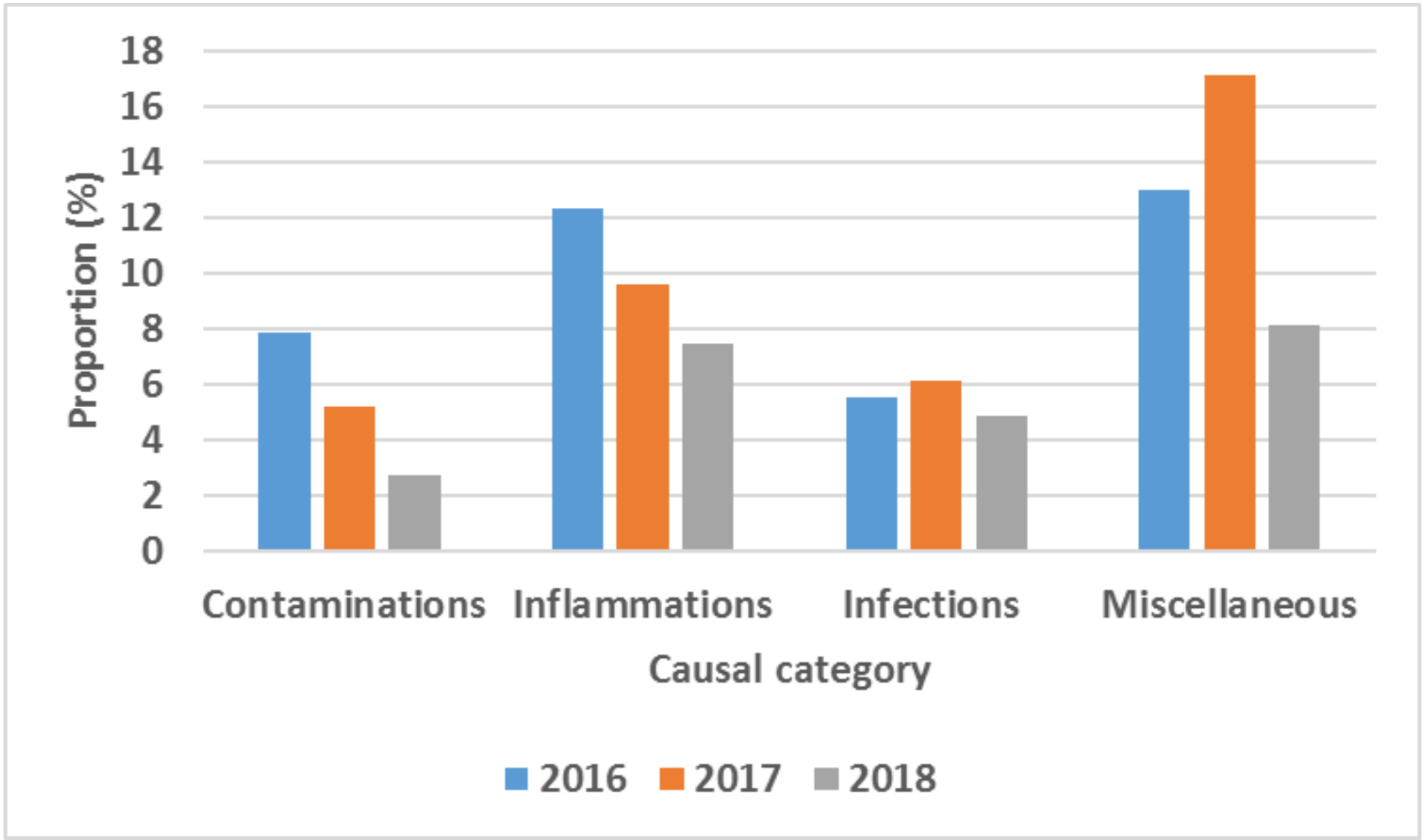


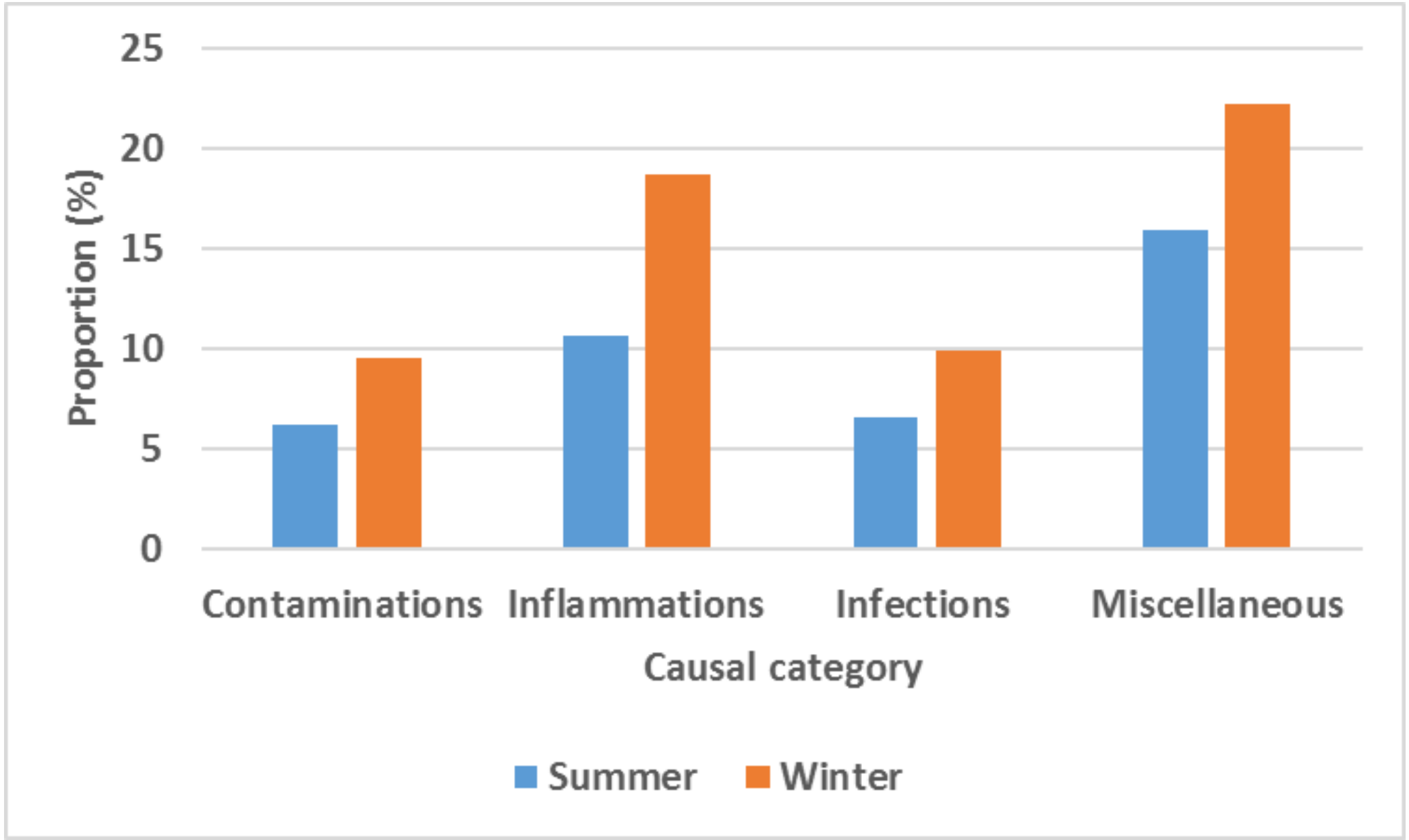
Figure 5: Annual proportional red offal condemnation according to causal category



# Table 1: Monthly proportional red offal condemnation according to causal category

| Month | Contaminations (%) | Inflammation (%) | Infections (%) | Miscellaneous[#] (%) | Total (%) |
|---|---|---|---|---|---|
| January | 110 (0,3) | 321 (0,8) | 168 (0,4) | 454 (1,2)* | 1053 (2,7) |
| February | 341 (0,9) | 554 (1,4) | 335 (0,9) | 989 (2,5)* | 2219 (5,7) |
| March | 666 (1,7)* | 1188 (3,0)* | 606 (1,5) | 1215 (3,1) | 3675 (9,4) |
| April | 794 (2,0)* | 788 (2,0) | 961 (2,5)* | 1709 (4,4) | 4252 (10,9) |
| May | 756 (1,9) | 924 (2,4) | 1206 (3,1)* | 1457 (3,7) | 4343 (11,1) |
| June | 852 (2,2) | 1679 (4,3)* | 922 (2,4) | 1772 (4,5) | 5225 (13,3) |
| July | 630 (1,6) | 1234 (3,2) | 407 (1,0) | 1822 (4,7)* | 4093 (10,5) |
| August | 639 (1,6) | 1322 (3,4)* | 608 (1,6) | 1475 (3,8) | 4044 (10,3) |
| September | 450 (1,1) | 1076 (2,7)* | 380 (1,0) | 1265 (3,2) | 3171 (8,1) |
| October | 412 (1,1) | 1105 (2,8)* | 375 (1,0) | 929 (2,4) | 2821 (7,2) |
| November | 370 (0,9) | 997 (2,5) | 332 (0,8) | 1493 (3,8)* | 3192 (8,2) |
| December | 154 (0,4) | 334 (0,9) | 182 (0,5) | 399 (1,0) | 1069 (2,7) |
| Total | 6174 (15,8) | 11522 (29,4) | 6482 (16,6) | 14979 (38,3) | 39157 (100,0) |

Figure 6: Seasonal proportion red offal condemnation according to causal category



# Table 2: Annual proportional distribution of causes for liver condemnations

| Reason for condemnation | Year | | | |
|---|---|---|---|---|
| | 2016 | 2017 | 2018 | Overall |
| Abscess (%) | 3137 (14,75) | 4283 (20,14)* | 2054 (9,66) | 9474 (44,54) |
| Contamination (%) | 287 (1,35)* | 243 (1,14) | 138 (0,65) | 668 (3,14)[a] |
| Haematomas/blood vessel lesions (%) | 627 (2,95)* | 555 (2,61) | 251 (1,18) | 1433 (6,74) |
| Hydatidosis (%) | 161 (0,76) | 134 (0,63) | 403 (1,89)* | 698 (3.28)[a] |
| Peritonitis (%) | 2924 (13,75)* | 2386 (11,22) | 1882 (8,85)* | 7192 (33,81) |
| *Stilesia hepatica* (%) | 255 (1,20) | 856 (4,02)* | 146 (0,69) | 1257 (5,91) |
| Melanosis (%) | 53 (0,25) | 346 (1,63)* | 7 (0,03) | 406 (1,91) |
| Septicaemia (%) | 1 (0,005) | 3 (0,01) | 0 (0,00) | 4 (0,02) |
| Blood splash (%) | 0 (0,00) | 109 (0,51)* | 0 (0,00) | 109 (0,51) |
| Actinomycosis (%) | 0 (0,00) | 13 (0,06) | 17 (0,08)* | 30 (0,14) |
| Total (%) | 7445 (35,00) | 8928 (41,97) | 4898 (23,03) | 21271 (100,00) |

Table 3: Seasonal proportional distribution of causes for liver condemnations

| | Season | | |
|---|---|---|---|
| **Reason for condemnation** | **Summer** | **Winter** | **Overall** |
| Abscess (%) | 3743 (17,60) | 5731 (26,94) | 9474 (44,54) |
| Contamination (%) | 302 (1,42) | 366 (1,72) | 668 (3,14) |
| Hematomas/blood vessel lesions (%) | 781 (3,67)* | 652 (3,07) | 1433 (6,74) |
| Hydatidosis (%) | 464 (2,18)* | 234 (1,10) | 698 (3.28) |
| Peritonitis (%) | 2555 (12,01) | 4637 (21,80)* | 7192 (33,81) |
| *S. hepatica* (%) | 248 (1,17) | 1009 (4,74)* | 1257 (5,91) |
| Melanosis (%) | 339 (1,59)* | 67 (0,31) | 406 (1,91) |
| Septicaemia (%) | 0 (0,00) | 4 (0,02) | 4 (0,02) |
| Blood splash (%) | 0 (0,00) | 109 (0,51)* | 109 (0,51) |
| Actinomycosis (%) | 13 (0,06) | 17 (0,08) | 30 (0,14) |
| **Total (%)** | **8445 (39,70)** | **12826 (60,30)** | **21271 (100,00)** |

# Table 4: Annual proportional distribution of causes for lung condemnations

| Reason for condemnation | Year | | | Overall |
|---|---|---|---|---|
| | 2016 | 2017 | 2018 | |
| Abscess (%) | 487 (4,16) | 538 (4,60) | 372 (3,18) | 1397 (11,94) |
| Contamination (%) | 906 (7,74)* | 735 (6,28)* | 288 (2,46) | 1929 (16,49) |
| Pleuritis (%) | 188 (1,61) | 402 (3,44)* | 239 (2,04) | 829 (7,09) |
| Hydatidosis (%) | 1504 (12,85) | 1341 (11,46) | 1210 (10,34)* | 4055 (34,66) |
| Emphysema (%) | 1198 (10,24)* | 588 (5,03) | 487 (4,16) | 2273 (19,43) |
| Pneumonia (%) | 289 (2,47) | 248 (2,12) | 192 (1,64) | 729 (6,23) |
| Melanosis (%) | 136 (1,16) | 244 (2,09)* | 108 (0,92) | 488 (4,17) |
| Total (%) | 4708 (40,24)[a] | 4096 (35,01)[a] | 2896 (24,75)[a] | 11700 (100,00) |

Table 5: Seasonal proportional distribution of causes for lung condemnations

| Reason for condemnation | Season | | |
|---|---|---|---|
| | Summer | Winter | Overall |
| Abscess (%) | 573 (4,9) | 824 (7,0) | 1397 (11,9) |
| Contamination (%) | 787 (6,7) | 1142 (9,8) | 1929 (16,5) |
| Pleuritis (%) | 329 (2,8) | 500 (4,3) | 829 (7,1) |
| Hydatidosis (%) | 1761 (15,1)* | 2294 (19,6) | 4055 (34,7) |
| Emphysema (%) | 901 (7,7) | 1372 (11,7) | 2273 (19,4) |
| Pneumonia (%) | 231 (2,0) | 498 (4,3)* | 729 (6,2) |
| Melanosis (%) | 230 (2,0) | 258 (2,2) | 488 (4,2) |
| Total | 4812 (41,1)[a] | 6888 (58,9)[a] | 11700 (100.0) |

# Conclusions

- **Overall condemnation (15.65%) higher than from other studies (<10%)**
  - ✓Cadmus and Adesokum, 2009; Yiber et al., 2015; Shaibu et al., 2018 Mohammed et al., 2018
- **Condemnation comparable to yet other studies (14-18%)**
  - ✓Swai and Ulicky, 2009; Lymo et al., 2018; Chinonyerem and Kalu., 2019
- **Liver had highest condemnation (54.32%) due to anatomical location and physiological function or higher abattoir standards**
  - ✓Frandson et al., 2009; Cullen and Brown, 2012; Gu and Manautou, 2012
- **Liver condemnation mainly due to abscess possibly from rumen acidosis in the feedlot or high concentrate feed**
  - ✓Reinhardt and Hubbert, 2015; Amachawadi and Nagaraja, 2016
- **Lungs had 2$^{nd}$ highest condemnation (29.88%) due to anatomical, physiology**
  - ✓Radostits et al., 2006; Frandson et al., 2009; Lopez, 2012; Erickson et al., 2015

# Conclusions (cont'd)

- **Higher precipitation in 2016-7 responsible for higher condemnation rates than that in 2018**
  - ✓http://weather.namsearch.com/wdhrainsummary.php
- **Higher condemnation rates in June possibly due to sluggish start to work by abattoir stuff leading to more contamination-related condemnations**
  - ✓Ejeh et al., 2015; Alemu et al., 2017
- **Higher lung condemnations in summer due to higher rates of hydatidosis**
- **As expected condemnations due to pneumonia were higher in winter due to wide diurnal temperature fluctuations in semi-arid Namibian climatic conditions huddling of animals**
  - ✓https://www.timeanddate.com/weather/namibia/windhoek/climate

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