9. (1.75 points)

An actuary is developing a rating algorithm for a new product covering professional liability for nurses working in hospitals.

Characteristics considered:

- Age of nurse
- Gender of nurse
- Hours worked per week by each nurse
- Number of nurses employed by the hospital
- Specialty of the nurse (Cardiac or General)

Given the following:

- 20% of customers will switch insurers based on price.
- The company's competitor uses specialty of nurse in their rating algorithms and charges the true expected cost.
- At the start of the program the company and the competitor each write 100 policies for Cardiac Nurses and 100 policies for General Nurses.
- There are no underwriting expenses or profit.

Specialty	True Expected Cost
Cardiac	$500
General	$200

a. (0.5 point)

For one of the characteristics, briefly discuss two reasons why it would be an appropriate exposure base.

b. (0.5 point)

Assess if age of nurse is an appropriate rating variable using two social criteria.

c. (0.75 point)

The company decides not to use specialty of nurse in their rating algorithm. Quantify the effect on profitability for the company after one renewal cycle.

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QUESTION 9	
TOTAL POINT VALUE: 1.75	**LEARNING OBJECTIVE(S): A1, A7**

SAMPLE ANSWERS

Part a: 0.5 point

Sample 1
Hours worked.

Any two of the following three:

- It's proportional to the expected risk, as more hours nurses worked, more prob to cause accidents.
- It's easy to get from the employee system of hospital. So it's practical and objective, and easy to get and verify.
- Historical precedence: Hours worked is a common exposure base.

Sample 2
Number of nurses employed.

Any two of the following three:

- Proportional to expected loss: It makes sense that the more employees the hospital has, the more opportunity there is for a prof liab loss.
- Practical: This is clearly defined and should be easy to verify w/ HR.
- Considerate of historical precedence: Many insurers currently use # of professionals in a professional liab. Product.

Part b: 0.5 point

Any two of the following three:

Affordability – It's not good because younger nurse may be less experienced and their premiums will be higher. But they may earn less salaries since they are less experienced.

Causality – There is no causality between the age of the nurse and the likelihood of error they might make. Since some nurse may be older but they may just start the nursing career. Hence it's not causal to the expected loss. OR – Appropriate b/c it's easy to see causal relationship, that younger, inexperienced nurses are more likely prone to medical errors, and it increases public acceptance of the var.

Controllability – Age is not controllable since one cannot pick his/her age.

Privacy – Not appropriate b/c it violates privacy; nurses might feel their privacy violated by disclosing their ages against their will. OR – Age is okay given the consideration of privacy since there are many places that have and use the info: It's commonly used in insurance already.

Part c: 0.75 point

Competitor: Will charge correct rate for each class: $500 for Cardiac, $200 for General

Sample 1
Competitor

Competitor	Start	End	True Cost
Cardiac	100	100 x (1 – 0.2) =80	$500
General	100	120	$200

Insurer	Start	End	True Cost
Cardiac	100	100 + 20 = 120	$350
General	100	100 x (1 – 0.2) = 80	$350

Profit = 120 x (350 – 500) + 80 x (350 – 200) = -6,000

Sample 2

	# policy	change to # policy	# after renewal
Cardiac	100	+ 100 x 20%	120
General	100	+ 100 x 20%	80

Start: 2 x 100 x 350 = 70,000
Renewal: (120 + 80) x 350 – (120 x 500 + 80 x 200) = -6,000

After one renewal cycle the company will lose $6,000

EXAMINER'S REPORT

Candidates were expected to have a general knowledge of the criteria for an appropriate exposure base and the appropriateness of a rating variable in relation to social criteria.

Common errors included:

- Selecting characteristics that are not appropriate as an exposure base
- Commenting on the appropriateness of a characteristic as a rating variable and not as an exposure base
- Mistakenly using rate for loss cost
- Not calculating the impact on profit

Part a

Candidates were expected to know how to select an appropriate exposure base, and provide rationale for the selection.

Common errors included:

- Providing age, gender, or specialty as an exposure base.
- Listing a criterion for determining the appropriateness of an exposure base with no other explanation related for the specific exposure base.
- Commenting on the appropriateness of a characteristic as a rating variable and not as an exposure base. For instance stating "Legal – It should be legal to use this characteristic."

Part b

Candidates were expected to identify and explain two social criteria and the appropriateness of the age of a nurse as a rating variable.

A common mistake was to provide comments on the appropriateness of age as rating variable based on criteria that were not social criteria.

Part c

Candidates were expected to understand the impact of anti-selection on the number of insureds and the resulting impact to profit.

Common errors included:

- Showing a change in only one category of nurse (cardiac or general)
- Using an incorrect true cost
- Not calculating the impact on profit
- Discussing anti-selection without any calculations